JUL 2 8 2003

ENGINEERING DATA TRANSMITTAL

Page 1 of _/ 1. EDT 6**33**897

2. To: (Receiving Organization)				3.	From: (O	riginating	g Orga	anizatio	on)	4. Related EDT No.:				
DST Integrity Project				DS	ST Proj	ject & Maintenance Eng.				N/A				
5. Pro	j./Prog.	/Dept./Div.:		6.	Design A	uthority/E	Design	Agent	/Cog. Engr.:	ł .	ase Order	No.:		
DST	Inte	grity P	roject	Ci	nris E	. Jens	sen			N/A				
8. Oriç	ginator I	Remarks:								9. Equip./Component No.:				
None	None									.P-103 em/Bldg./F	acility:			
Ì										DST	J, D.a.g., 1	domey.		
	<u></u>										12. Major Assm. Dwg. No.:			
14 8										N/A		J		
11. KE 											nit/Permit /	Application	No.:	
										N/A				
										14. Required Response Date:				
				<u>.,</u>					<u> </u>	23	July 0	3	·	
15.				DATA TRA	ANSMITTE	D				(F)	(G)	(H)	(1)	
(A) Item No.		(B) Docume	nt/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title	e or D	escript	ion of Data Transmitted	Approval Desig- nator	Reason for Trans- mittal	Origi- nator Dispo- stion	Receiv- er Dispo- sition	
1	RPP-	-13802		All	0	Ultra	ason	ic I	nspection	EQ	1	1		
						Resu	lts	for	Double-Shell					
	,								103 - FY 2003					
				<u> </u>		Tallx	~ 1 1	. AI	103 11 2003			<u>-</u>		
		· <u>···</u>								 			 _	
			·			 				<u> </u>		<u> </u>		
16.					<u></u>		KEY			<u> </u>		··	<u> </u>	
		· · · · · · · · · · · · · · · · · · ·					KEY							
		ignator (F)	He He	ason for Trai	nsmittal (G	·		}	Di	Disposition (H) & (I)				
E, S (See	S, Q, D WHC- Sec. 12	OR N/A CM-3-5, 2.7)	Approval Release Information	4. Review 5. Post-Re 6. Dist. (Re	view eceipt Ack	now. Red	quired	,	 Approved Approved w/comme Disapproved w/com 	4. Reviewed no/comment nent 5. Reviewed w/comment mment 6. Receipt acknowledged				
17.	***			(Se	SIG e Approva	NATURE	E/DIS	TRIBUT	ΓΙΟΝ red signatures)		<u></u>	·,,		
(G) Rea-	(H) Disp.	(J) Name	(K) Signatu				(G) Rea-	(H) Disp.		(K) Signat	ure (L	.) Date	(M) MSIN	
son_	Disp.	<u> </u>	thority N/A	···			son	Disp.						
		Design Age		A								;		
1	1	Cog. Eng.	CE Jemsen	115	ing03 2	3-26								
1	1	Cog. Mgr.	BH Thacker	1411	7-16-03	\$7-16								
1	1	QA	WL Adams	Adam	w 7/11	185-07 03								
	,	Safety	N/A	29	714								****	
1	1	Env.	TL Faust	Jais	4-5	pzba				· · · · · ·	 			
18.	<u> </u>	A	19	1			20.	11	/	1	APPROV		uired)	
//	I Gen	H	HD.	H	4	aly (12)	M	Hebr	1-25-03	l —	No. N/A			
	1/		2- 1 04/3 /2010	down_	-			hack			Approved			
Sig/ia Origin	ature of	EDT	Date Authorize for Rece	d Representiving Organia	tative zation	Date	Desig Cogn	in Auth izant N	ority/ Date lanager	1 =	Approved			
		2 (40/07)	<u></u>	<u></u>							Disapprov	ed w/com		

DISTRIBUTION SHEET To From Page 1 of 1 Distribution DST Project & Maintenance Eng. Date 23 July 2003 Project Title/Work Order **EDT No**. 633897 Ultrasonic Inspection Results for Double-Shell Tank 241-AP-103 - FY 2003 ECN No. N/A Text Attach./ EDT/ECN MSIN With All Text Only Appendix Name Only Attach. Önly RP Anantatmula R1-14 Х JL Castleberry R3-26 Х VL Callahan H6-60 Х GP Duncan R3-26 Х BK Everett S5-07 Х TL Faust S5-03 Χ LJ Julyk R1-14 Х PC Miller R1-51 Х MJ Ostrom S5-07 Χ TC Oten S5-07 Χ RL Schlosser R1-14 Χ BH Thacker S5-10 Х JO Ferguson 50-03 X

ULTRASONIC INSPECTION RESULTS FOR DOUBLE-SHELL TANK 241-AP-103 - FY 2003

Chris E. Jensen

CH2M HILL HANFORD GROUP, INC.

Richland, WA 99352

U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: EDT 633897

UC:

Cost Center: 7G220

Charge Code: 500447

B&R Code:

Total Pages: //p-2

Key Words: Ultrasonic, inspection, exaination, UT, DST

Abstract:

This report documents the required ultrasonic examination of double-shell tank 241-AP-103 performed during FY 2003. This examination included specified primary wall areas, welds, and lower knuckle. Results indicated that there was no reportable wall thinning, cracking, or pitting in any of the plate areas examined.

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Printed in the United States of America. To obtain copies of this document, contact: Document Control Services, P.O. Box 950, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.

Release Stamp

Approved For Public Release

ULTRASONIC INSPECTION RESULTS FOR DOUBLE-SHELL TANK 241-AP-103 – FY 2003

C.E. Jensen

CH2M HILL Hanford Group, Inc.

Date Published July 2003



Post Office Box 1500 Richland, Washington

Prepared for the U.S. Department of Energy Office of River Protection

Contract No. DE-AC27-99RL14047, Modification M030

Approved for public release; distribution is unlimited

Ultrasonic Inspection Results for Double-Shell Tank 241-AP-103 – FY 2003

July 2003

Prepared by:

A. M. Ermi, COGEMA Engineering Corporation

Prepared for:

C. E. Jensen CH2M HILL Hanford Group Inc.

CONTENTS

1.0	INTRODUCTION	1-1
2.0	OBJECTIVE AND SCOPE	2-1
3.0	INSPECTION EQUIPMENT DESCRIPTION	3-1
4.0	UT INSPECTION DESCRIPTION	4-1
5.0	INDICATION REPORTING CRITERIA	5-1
6.0	PERFORMANCE DEMONSTRATION TEST	6-1
7.0	TANK 241-AP-103 HISTORY	7-1
8.0	GENERAL REQUIREMENTS AND INSPECTION SCOPE	8-1
9.0	EQUIPMENT SETUP AT AP TANK FARM	9-1
10.0	INSPECTION RESULTS	10-1
11.0	EVALUATION OF INSPECTION RESULTS	11-1
12.0	FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS	12-1
13.0	REFERENCES	13-1
	ATTACHMENTS	
1.	AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING (Procedure COGEMA-SVUT-INS-007.3, Rev. 1)	Att. 1-1
2.	COGEMA "AUTOMATED ULTRASONIC THICKNESS DATA REPORT SHEETS"	Att. 2-1
3.	ULTRASONIC EXAMINATION OF DOUBLE-SHELL TANK 241-AP-103 EXAMINATION COMPLETED APRIL 2003 (PNNL THIRD PARTY REVIEW)	. Att. 3-1

FIGURES

Figure 1-1. Typical Double-Shell Tank Configuration	1-1
Figure 3-1. P-scan Crawler System on Tank Mock-up	3-1
Figure 4-1. Schematic of UT Setup for Vertical Wall Inspection	4-2
Figure 4-2. Schematic of UT Setup for First Pass of Weld Inspections	4-2
Figure 4-3. Schematic of UT Setup for Second Pass of Weld Inspections	4-3
Figure 7-1. Waste Level History of Double-Shell Tank 241-AP-103.	7-1
Figure 9-1. Field Set-Up at Riser for Double-Shell Tank on AP-Farm	9-1
Figure 10-1. Schematic of UT Scan Paths on West Side of Tank 241-AP-103 Wall (via Riser 031)	. 10-2
Figure 11-1. Scan Data Average Wall Thickness Compared to Nominal Plate Thickness	.11-2
Figure 11-2. Gouge Adjacent to a Plate #4 Vertical Weld on Double-Shell Tank 241-AP-103	. 11-3
TABLES	
Table 10-1. Summary of Primary Tank Wall Scan 1 (via Riser 031)	. 10-3
Table 10-2. Summary of Primary Tank Wall Scan 2 (via Riser 031)	. 10-3
Table 10-3. Summary of Primary Tank Vertical Weld Scans (via Riser 031)	. 10-4
Table 10-4. Summary of Plate #5 / Knuckle Horizontal Weld Scans (via Riser 031)	. 10-4
Table 10-5. Primary Tank Vertical Wall Scan 1 - Plate 1 (via Riser 031)	. 10-5
Table 10-6. Primary Tank Vertical Wall Scan 1 - Plate 2 (via Riser 031)	. 10-5
Table 10-7. Primary Tank Vertical Wall Scan 1 - Plate 3 (via Riser 031)	10-6
Table 10-8. Primary Tank Vertical Wall Scan 1 - Plate 4 (via Riser 031)	10-6
Table 10-9. Primary Tank Vertical Wall Scan 1 - Plate 5 (via Riser 031)	10-7
Table 10-10. Primary Tank Vertical Wall Scan 2 - Plate 1 (via Riser 031)	10-7

Table 10-11. Primary Tank Vertical Wall Scan 2 - Plate 2 (via Riser 031)
Table 10-12. Primary Tank Vertical Wall Scan 2 - Plate 3 (via Riser 031)
Table 10-13. Primary Tank Vertical Wall Scan 2 - Plate 4 (via Riser 031) 10-9
Table 10-14. Primary Tank Vertical Wall Scan 2 - Plate 5 (via Riser 031) 10-9
Table 10-15. Primary Tank Vertical Wall Weld Scan - Plate 2 (via Riser 031) 10-10
Table 10-16. Primary Tank Vertical Wall Weld Scan - Plate 3 (via Riser 031) 10-10
Table 10-17. Primary Tank Vertical Wall Weld Scan - Plate 4 (via Riser 031)10-11
Table 10-18. Primary Tank Vertical Wall Weld Scan - Plate 5 (via Riser 031)10-11
Table 10-19. Primary Tank Vertical Wall Weld Scan Flaws - Plates 4 and 5 (via Riser 031)
Table 10-20. Primary Tank Horizontal Weld - Plate 5 to Knuckle Scan, Plate Side (via Riser 031)
Table 10-21. Primary Tank Horizontal Weld - Plate 5 to Knuckle Scan, Knuckle Side (via Riser 031)
Table 11-1. Double-Shell Tanks Chronological Inspection Results Findings
Table 11-2. Tank Wall Thinning By Nominal Plate Size

TERMS

ASME American Society of Mechanical Engineers

CH2M HILL CH2M HILL Hanford Group, Inc.
COGEMA Engineering COGEMA Engineering Corporation

DST double-shell tank

DSTIP Double-Shell Tank Integrity Project

FY fiscal year

HAZ heat-affected zone
ID inner-diameter
JCS Job Control System

NDE Nondestructive Examination
PDT Performance Demonstration Test
PNNL Pacific Northwest National Laboratory
PUREX Plutonium Uranium Extraction Facility

RL U.S. Department of Energy, Richland Operations Office

RMS Root Mean Square

T-SAFT Tandem Synthetic Aperture Focusing Technique

TWINS Tank Waste Information Network System

TWRS Tank Waste Remediation System

UT Ultrasonic Testing

WDOE Washington State Department of Ecology

EXECUTIVE SUMMARY

Background

Through FY 1999, six double-shell tanks were ultrasonically examined to meet the integrity requirements of the *Washington Administrative Code*, Chapter 173-303, "Dangerous Waste Regulations". Subsequent to the examinations, integrity assessment reports were issued for each double-shell tank farm and submitted to the Washington State Department of Ecology in FY 1999. In June 2000, the Washington State Department of Ecology issued Administrative Orders 00NWPKW-1250 and 00NWPKW-1251 providing prescriptive examination requirements for all double-shell tanks by FY 2005. This report documents the required ultrasonic examination of double-shell tank 241-AP-103, completed in the third quarter of FY 2003.

Methodology

The primary wall examinations consisted of a vertical 30-inch strip consisting of two 15-inch ultrasonic examination scans. The primary wall vertical examinations were looking for wall thinning, cracking, and pitting in the tank wall. The weld heat-affected zones examined included 25 linear feet of vertical welds and 20 linear feet of horizontal welds. These examinations were performed using the P-scan nondestructive examination technique.

The ultrasonic examinations were carried out in accordance with ASME Boiler and Pressure Vessel Code, Section V, "Nondestructive Examinations". The personnel and non-destructive examination equipment were qualified to perform the examinations on the double-shell tanks by performance demonstration tests administered by Pacific Northwest National Laboratories.

The required accuracy for the ultrasonic examinations is to be within 0.020 inches for wall thinning, 0.050 inches for pitting, and 0.10 inches for cracking. The performance demonstration test revealed that the examiners meet this requirement.

Results

Results indicated that there was no reportable wall thinning in any of the plate areas examined. In addition, there were no reportable pitting indications nor any crack-like indications detected in any of the plates (excluding weld heat-affected zones).

There were no reportable wall thinning nor reportable pitting indications detected in any of the weld heat-affected zones for the primary tank vertical weld scans and the knuckle-to-shell horizontal weld scan. However, there was one linear indication detected in the weld heat-affected zone of the Plate #5 vertical weld. The linear indication measured 2.92 inches in length, but it was indeterminate whether the linear indication was inner-diameter connected or if it was in the weld. It is recommended that a follow-up inspection using different evaluation methods be performed to more precisely characterize the linear indication and to establish if it is reportable.

In addition, a small, 1.42 inch long gouge was observed on an area of Plate #4, just above the Plate #4 / Plate #5 horizontal weld. The gouge does not appear to pose any threat to the tank integrity, but this area should be monitored during subsequent tank inspections.

Conclusions

Based on the overall results of this examination, the material condition of the tank is satisfactory for continued operation. However, it is recommended that the linear indication detected in the weld heat-affected zone in Plate #5 be further evaluated. As a result of that follow-up inspection, an assessment regarding the integrity of the tank can be made and a decision regarding subsequent inspection intervals can be formulated.

The tanks inspected to date are summarized in the following table.

Double-Shell Tanks Inspected Through May 2003

Double-Shell	Inspection Year (FY)										
Tank	1997	1998	1999	2000	2001	2002	2003				
AN-101						Х					
AN-102					X						
AN-105			х			(1)					
AN-106	***		х								
AN-107		х									
AP-101			<u> </u>				X (3)				
AP-103							X (4)				
AP-105							х				
AP-107	·			x							
AP-108				x		(2)					
AW-101	 -	,			x						
AW-102			-			x	(5)				
AW-103	Х	_				"					
AW-104						х					
AW-105					X						
AW-106			 -		<u> </u>	X					
AY-101	*				х	X					
AY-102			X	·			- 				
AZ-101			x								

⁽¹⁾ Limited scope reexamination.

⁽²⁾ Linear indication evaluated.

⁽³⁾ Includes primary knuckle Tandem Synthetic Aperture Focusing Technique (T-SAFT) examination.

⁽⁴⁾ Linear indication detected; Further evaluation recommended.

⁽⁵⁾ Primary knuckle T-SAFT examination only.

1.0 INTRODUCTION

In May 1996 the Tank Waste Remediation System (TWRS) Decision Board recommended, and U.S. Department of Energy, Richland Operations Office (RL) agreed, that the condition of the double-shell tanks (DST) should be determined by ultrasonic testing (UT) inspection of a limited area in six of the 28 DSTs (Figure 1-1). The Washington State Department of Ecology (WDOE) agreed with the strategy of limited ultrasonic inspection of DSTs. Data collected during the UT inspections will be used to assess the condition of the tank, judge the effects of past corrosion control practices, and satisfy a regulatory requirement to periodically assess the integrity of waste tanks.

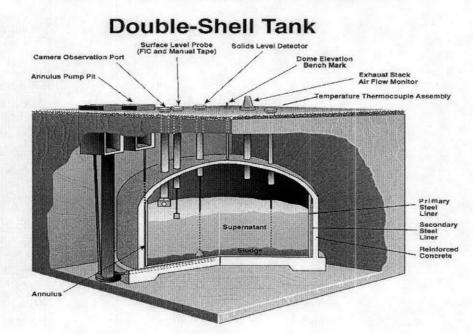


Figure 1-1. Typical Double-Shell Tank Configuration.

In November 1996, DST 241-AW-103 was the first tank inspected to determine if Hanford DST walls could be inspected without removing the existing surface rust and scale. Equipment similar to that used to perform routine inspections of oil tanks and large pipelines was used. UT sensors were mounted on a remote-controlled crawler that used magnetic wheels to affix itself and move about on the tank walls. The crawler was deployed into the tank annulus and vertically traversed the primary and secondary containment walls to collect data on the wall thickness and the size of any pits or cracks. The successful completion of this inspection met the requirements of RL Milestone T21-97-455 and represented the first UT inspection of a Hanford DST (*Final Report - Ultrasonic Examination of Tank 241-AW-103 Walls*, Leshikar 1997).

In fiscal year (FY) 1998, FY 1999, and FY 2000, similar inspections were performed per Engineering Task Plans HNF-2820 (Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks, Pfluger 1999) and RPP-5583 (Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2000, Jensen 2000) on 241-AN-107, 241-AN-106, 241-AN-105, 241-AY-102, 241-AZ-101, 241-AP-107, and 241-AP-108. An

attempt was made to examine 241-AY-101 in FY 1999, but corrosion product on the tank wall prevented reliable examination.

In June 2000, WDOE issued an Administrative Order requiring UT examinations of the remaining 20 DSTs through FY 2005 (Administrative Order No. 00NWPKW-1251, Failure to Comply with Major Milestone M-32 of the Tri-Party Agreement, Silver 2000). Based on the results of the above listed eight DST inspections and per WDOE Administrative Order requirements (Silver 2000), Engineering Task Plans RPP-6839 (Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2001, Jensen 2000a), RPP-7869 (Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2002, Jensen 2002), RPP-8867 (Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks 241-AP-108, 241-AY-101, and 241-AZ-102 - FY2002, Jensen 2002a), and RPP-11832 (Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2003, Jensen 2002b) were prepared for ultrasonic DST inspections scheduled for FY 2001, FY 2002, and FY 2003.

In FY 2001, UT inspections were performed on four DSTs: 241-AN-102, 241-AW-101, 241-AW-105, and 241-AY-101 (following cleaning of selected areas of the 241-AY-101 wall). In FY 2002, UT inspections were performed on five more DSTs: 241-AN-101, 241-AW-102, 241-AW-104, 241-AW-106 and 241-AY-101 (a more extensive examination of 241-AY-101). The FY 2002 examination of 241-AP-108 was limited to characterization of the linear indication found in FY 2000. In addition, a limited scope reexamination of the upper walls of tank 241-AN-105 was performed in FY 2002. A primary knuckle inspection on 241-AW-102 using the Tandem Synthetic Aperture Focusing Technique (T-SAFT) not completed during FY 2002 was completed in early FY 2003.

DST 241-AP-103 was the third of four tanks selected for inspection in FY 2003 (the others being 241-AP-101, 241-AP-105 [completed] and 241-AZ-102). Inspection of tank 241-AP-103 was completed in the third quarter of FY 2003, and is the subject of this report. The services of COGEMA Engineering Corporation (COGEMA Engineering) were retained to provide UT examinations, procedures and inspectors, and report the inspection results. Examination of 241-AP-103 was performed with UT equipment provided by CH2M HILL Hanford Group, Inc. (CH2M HILL).

2.0 OBJECTIVE AND SCOPE

This report describes the inspection system, evaluates the inspection results, and documents findings with conclusions and recommendations. The inspections were conducted in accordance with the criteria and scope set forth in RPP-11832 (Jensen 2002b) for the FY 2003 UT inspection of DST 241-AP-103.

3.0 INSPECTION EQUIPMENT DESCRIPTION

Crawler / Scanning Bridge System – The crawler is a remotely controlled device that delivers the ultrasonic transducers to the tank walls. The crawler used during P-scan imaging weighs approximately 30 pounds and has dimensions (including its traveling bridge) of approximately 21 inches wide by 18 inches long by 6 inches high. The traveling bridge on the crawler can be outfitted with various ultrasonic transducer configurations (Figure 3-1).

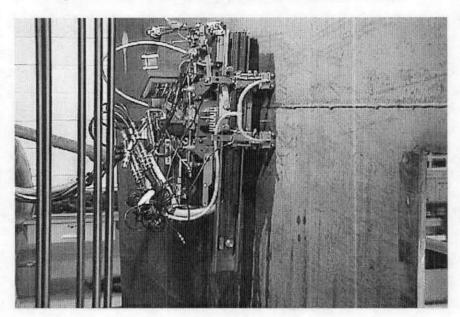


Figure 3-1. P-scan Crawler System on Tank Mock-up.

The P-scan crawler systems is deployed through a 24 inch annulus inspection riser using a customized deployment tool. The crawler attaches to the tank wall with two pairs of magnetic wheels. As the crawler moves slowly forward the transducers glide from side-to-side over the tank wall surface. Water couplant is continuously fed to each transducer at a rate needed to maintain an acceptable signal.

Deployment Tool – A deployment tool was specifically designed to insert and retrieve the scanning system into and out of the DST annular space. The scanner sits on a platform that is manually lowered to the appropriate elevation. The platform has cables attached that can be controlled to move the scanner platform into contact with the examination surface. The scanner is then driven onto the surface. The deployment tool is retracted until the scanner needs to be removed from the annular space.

P-scan – P-scan is the name of the computerized pulse-echo ultrasonic inspection system used by the inspection vendor. The P-scan system is manufactured by Force Institute in Denmark. It acquires data from zero and angle beam transducers mounted on the crawler, allows real-time analysis, and records the data in electronic memory for post inspection analysis. Force Institute has designated "P-scan mode" to represent the angle beam (flaw length) view and "T-scan

mode" to represent the zero beam (thickness) view. T-scan mode is used for normal operation and, if crack-like indications are detected, then the P-scan mode is employed.

During normal T-scan and P-scan operations, the waveforms of the reflected sound wave signals for each transducer are displayed in the "A-scan monitoring mode". The displays are continuously monitored (but not saved), and are primarily used to verify that the transducers are functioning properly (e.g., there is proper probe contact, adequate water flowing, and correctly operating transducer cables). When an indication is detected, the area is rescanned using the "A-scan recording mode". The recorded A-scan waveforms are then reviewed off-line, serving as an additional tool in the evaluation of the indication.

Overview Camera – This camera was deployed to observe the area immediately around the inspection area and to aid crawler deployment in the annulus.

Side-view Camera – This camera and light system were installed in a riser adjacent to the inspection riser to provide an overall view of the inspection process.

Riser Enclosure – A modular structure that is placed over the inspection riser. This structure is used to combat adverse weather conditions and supplies an internal hoist for deployment of equipment.

Data Acquisition Control Center – A pull-type trailer was used to house the crawler controls, video monitors, and data collection and evaluation hardware. The trailer was located inside the AP Tank Farm boundary fence.

4.0 UT INSPECTION DESCRIPTION

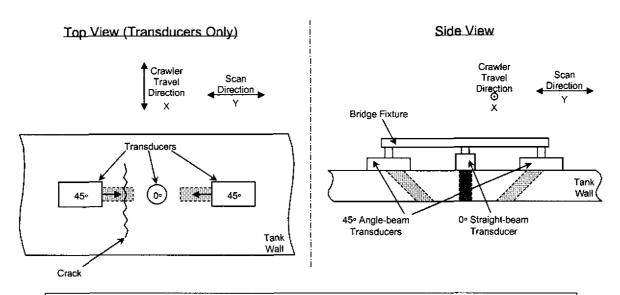
The following is the description of the data collection methodology:

Tank inspection was performed under Job Control System (JCS) work package number 2E-02-1531. All work steps, guidelines, procedures, personnel responsibilities, and protocol for the inspection (Jensen 2002b) were included in the subject work package. The COGEMA Engineering procedure that establish the methods, equipment and requirements for the P-scan imaging system UT measurements and flaw detection is *Automated Ultrasonic Examination For Corrosion And Cracking*, COGEMA-SVUT-INS-007.3 (Attachment 1).

The remotely controlled, steerable crawler was used to deliver the P-scan UT transducers to the tank wall (Figure 3-1). The crawler was deployed through the 24 inch diameter annulus inspection Riser Number 031 to perform the vertical wall scans, and the vertical and horizontal weld scans.

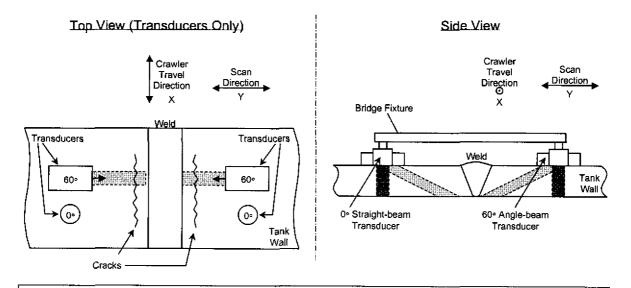
The P-scan crawler inspects the primary tank wall using one dual-element 0 degree transducer to detect wall thinning and corrosion pitting, and two 45 degree shear-wave transducers to detect cracking transverse to the scanning direction. This examination setup is illustrated in the Figure 4-1 schematic. To detect cracks parallel to the weld, a 60 degree shear-wave transducer was directed toward the weld and a dual-element 0 degree transducer is also included to detect wall thinning and corrosion pitting (Figure 4-2). To detect cracks oriented perpendicular to welds, two opposing 45 degree shear-wave transducers were directed parallel to the weld. Welds were examined from both sides of the weld crown (Figure 4-3). Note that weld and weld examination refer to the UT examination of the heat-affected zone (HAZ).

Figure 4-1. Schematic of UT Setup for Vertical Wall Inspection



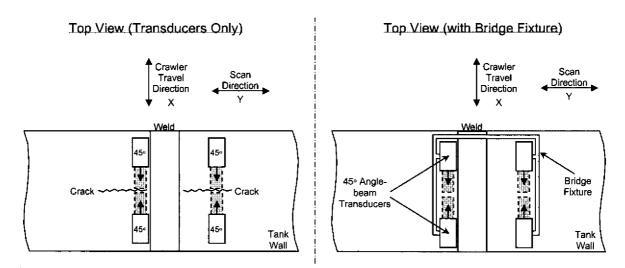
Vertical Wall Inspection Setup – Uses two 45° Transducers and one 0° Transducer (Inspect for Wall Thinning, Pitting and Axial Cracks)

Figure 4-2. Schematic of UT Setup for First Pass of Weld Inspections



First Pass of Vertical and Horizontal Weld Inspection – Uses two 60° Transducers and two 0° Transducers (Inspect for Wall Thinning, Pitting and HAZ Cracks Parallel to the Weld)

Figure 4-3. Schematic of UT Setup for Second Pass of Weld Inspections



Second Pass of Vertical and Horizontal Weld Inspection — Uses four 45° Transducers (Inspect for Heat-Affected Zone Cracks Perpendicular to the Weld)

5.0 INDICATION REPORTING CRITERIA

COGEMA Engineering was required to report to the customer the following anomalies:

- Wall thinning that exceeded 10 percent of the nominal wall thickness
- Pit depths that exceeded 25 percent of the nominal wall thickness
- Cracks that exceeded 0.1 inch in depth.

The reporting criteria is established to identify indications that should be tracked. This tracking is to be used to determine if there is any active mechanism causing additional thinning, pit growth, or crack growth, based on subsequent examinations on the eight to ten year examination interval. The values are nominally 50% of the "acceptance criteria" established in *Acceptance Criteria for Non-Destructive Examination of Double-Shell Tanks* (Jensen 1995) and recommended in *Guidelines for Development of Structural Integrity Programs for DOE High-Level Waste Storage Tanks* (Bandyopadhyay et al. 1997).

For indications exceeding the "acceptance criteria", actions are initiated to evaluate the operability of the DST (Jensen 2002) through the occurrence reporting process. Indications exceeding the "reporting criteria" are reported to the CH2M HILL Project Engineer to be documented in the inspection report (Jensen 2002).

6.0 PERFORMANCE DEMONSTRATION TEST

Prior to field use, COGEMA Engineering personnel satisfactorily completed a performance demonstration test (PDT). The test was conducted to qualify personnel, test procedures, and ensure the equipment's ability to detect and size wall thinning, pits, and cracks in a series of test plates with artificial defects. The performance demonstration test was performed on a tank mock-up in the 306E Facility located in the Hanford Site 300 Area. This mock-up also demonstrated the successful deployment and retrieval of the equipment. The PNNL report, "Report on Performance Demonstration Test – PDT, May 2000," (Attachment 3 of Ultrasonic Inspection Results of Double-Shell Tank 241-AP-108, Jensen 2000b) provides the details of the complete evaluation of the P-scan system PDT.

7.0 TANK 241-AP-103 HISTORY

The 241-AP Tank Farm consists of eight DSTs located in the 200 East Area of the Hanford Site. These underground tanks were built from 1983 through 1986, and are 75 feet in diameter with an operating capacity of 1.16 million gallons.

Tank 241-AP-103 entered service in 1986. It began receiving non-complexed waste and continued to receive this waste until May 1990. From June 1990 until March 1994, the tank waste was designated as dilute non-complexed waste (Supporting Document for the Southeast Quadrant Historical Tank Content Estimate for AP-Tank Farm, Brevick et al., 1995). It is currently designed for storage of dilute complex waste that is the concentrated product from the 242-A Evaporator process. The tank contains approximately 895,000 gallons of supernatant, equivalent to approximately 325 inches of supernatant (Waste Tank Summary Report for Month Ending March 31, 2003, Hanlon 2003).

The waste level history since September 1986 is shown in Figure 7-1, based on data obtained from the Tank Waste Information Network System (TWINS)¹.

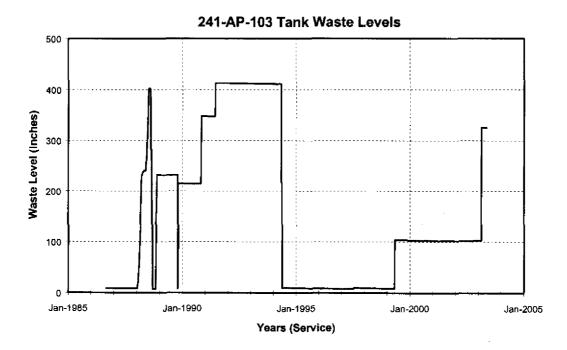


Figure 7-1. Waste Level History of Double-Shell Tank 241-AP-103.

Since January 1988, when the first waste transfer into the tank was made, the minimum recorded waste level was approximately 7.7 inches (September - October 1988, and again in October

¹ TWINS, http://twins.pnl.gov:8001/twins.htm, queried 05/16/2003 [Data Source: Measurements, SACS, Surface Level, Tank Name AP-103, All Measurement Date values]

1989). The maximum recorded waste level was approximately 413 inches, occurring from June to October, 1991. During the period from June 1991 to May 1994, the level remained relatively constant between 411 and 413 inches, averaging 412.2 inches. From May 4, 1999 to February 18, 2003, the level had also been relatively constant, averaging 102.7 inches. Since February 22, 2003, the level has been at approximately 325.5 inches.

Recorded temperatures of the tank have ranged from a maximum of 79.8°F in February 2003 to a minimum of 45.9°F in March 1996, based on data obtained from the TWINS².

² TWINS, http://twins.pnl.gov:8001/twins.htm, queried 05/16/2003 [Data Source: Measurements, SACS, Tank Temperature Readings, Tank Name AP-103, All Measurement Date values]

8.0 GENERAL REQUIREMENTS AND INSPECTION SCOPE

FY 2003 Contract Number 16449 specifies that the contractor provide (among others) the following deliverables to the Double-Shell Tank Integrity Project (DSTIP) organization:

- The contractor shall provide AP-103 NDE Support and Data Analysis
- The contractor shall prepare recommended engineering reports and studies as directed by the DSTIP project leads

The areas on the primary tank that were identified for UT inspection in the engineering task plan (Jensen 2002b) are described below.

Primary Tank Wall and Welds:

- A vertical strip (approximately 30 inches wide by 35 feet long) of the primary wall between the upper haunch transition and the lower knuckle. The vertical strip may be comprised of one or more strips whose total width is 30 inches.
- Twenty feet of the circumferential weld joining the cylinder to the lower knuckle. One vertical weld joining the lowest shell course plates (about 10 feet of weld), and one vertical weld joining the next to the lowest shell course plates (about 10 feet of weld). A minimum of twenty (20) feet of vertical weld shall be examined.

9.0 EQUIPMENT SETUP AT AP TANK FARM

Prior to performing the actual inspection, the riser (number 031, 24 inch) shield plug was removed, and a temporary cover and riser extension were secured to the riser. A portable enclosure was installed over the riser to provide the means for deploying the UT equipment and protecting the operators from the weather. An electric chain hoist, mounted to the roof frame, was used for maneuvering the equipment into position. The control center trailer was set up inside the AP Tank Farm's boundary fence, and the control cables were run along the ground to the equipment located at the riser. A typical tank farm setup for the AP-Farm is shown in Figure 9-1.

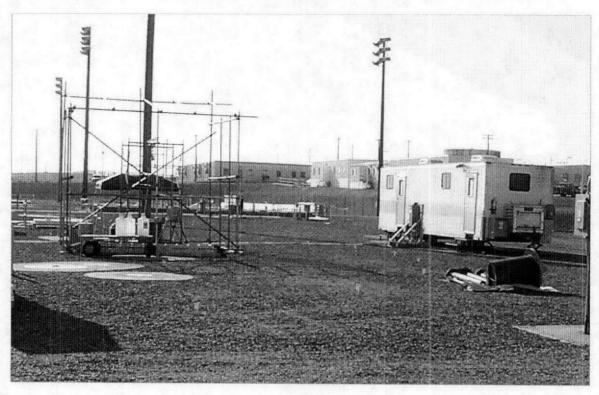


Figure 9-1. Field Set-Up at Riser for Double-Shell Tank on AP-Farm

10.0 INSPECTION RESULTS

Tank 241-AP-103 was fabricated from carbon steel plate. The primary tank's exterior surface varies from mill scale to coatings of various degrees of rust caused by in-service corrosion of carbon steel. A description of the plates is as follows with the location of the plates as shown in Figure 10-1 (*Tank Cross Section 241-AP Tanks*, Braun-Hanford 1986).

Primary knuckle (top) – Connects dome of tank to side-wall

Primary wall – Consists of (from top to bottom)

Plate #1 – approximately 7 feet 8 inch tall, 1/2 inch nominal thickness

Plate #2 – approximately 7 feet 8 inch tall, 1/2 inch nominal thickness

Plate #3 – approximately 7 feet 8 inch tall, 9/16 inch nominal thickness

Plate #4 – approximately 9 feet tall, 3/4 inch nominal thickness

Plate #5 – approximately 2 feet tall, 7/8 inch nominal thickness

Primary knuckle (bottom) – Approximately 15/16 inch nominal thickness. Connects sidewall of tank to primary tank bottom.

The crawler was deployed through the 24 inch diameter annulus inspection Riser 031 on the west side of tank 241-AP-103 for examinations of the primary wall and vertical and horizontal welds. All tank welds examined were in the "as-welded" condition. The various scan paths for the crawler are shown in Figure 10-1, along with other pertinent tank information.

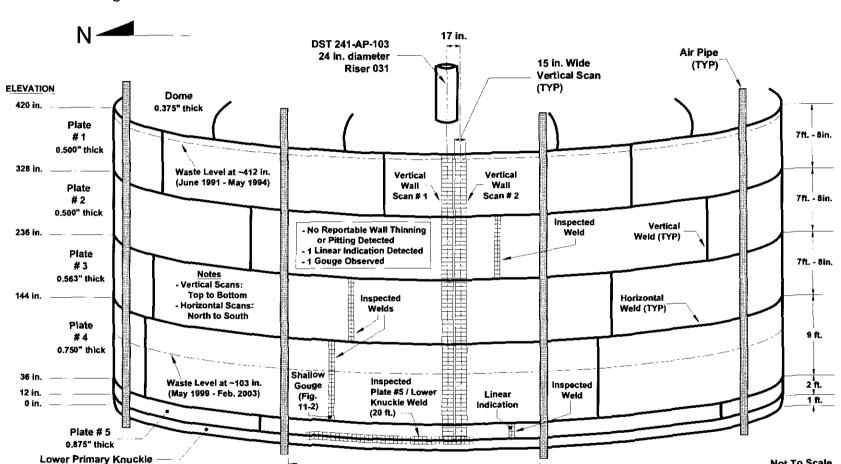
The UT data were examined by COGEMA Engineering's Level III certified inspector, and by Limited Level II certified inspectors. The Limited Level II inspectors were "P-Scan Limited", indicating that they are qualified to collect and examine the data, but are not qualified to interpret the data.

The following pages contain tables that present summary and detailed wall thickness data, which were derived from the COGEMA "Automated Ultrasonic Thickness Data Report Sheets". The inspection data sheets, the transducer calibration sheets, the original tank wall scan map, and an interpretation of the data by COGEMA Engineering's Level III qualified inspector are included in Attachment 2.

Tables 10-1 through 10-4 show the measured minimum wall thickness values and are displayed in a summarized form by wall plates, vertical plate welds, and horizontal knuckle weld. Although the data are reported to three significant figures, the accuracy of the wall thickness data, based on the results of the performance demonstration test, is 0.012 inch root-mean-square (RMS).

Not To Scale

0.938" thick



~29 feet

Figure 10-1. Schematic of UT Scan Paths on West Side of Tank 241-AP-103 Wall (via Riser 031)

Table 10-1. Summary of Primary Tank Wall Scan 1 (via Riser 031)

Plate Description	Elevation of Wall Scan (inches)	Wall Scan Distance (inches) (1)	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal	
Plate #1	416 to 332.3	83.7	0.500	0.491	98.2%	
Plate #2	327 to 239.4	87.6	0.500	0.482	96.4%	
Plate #3	235 to 146.8	88.2	0.563	0.550	97.7%	
Plate #4	143 to 37.7	105.3	0.750	0.739	98.5%	
Plate #5	35 to 14.2	20.8	0.875	0.869	99.3%	

⁽¹⁾ All scan widths were 15 inches.

Table 10-2. Summary of Primary Tank Wall Scan 2 (via Riser 031)

Plate Description	Elevation of Wall Scan (inches)	Wall Scan Distance (inches) (1)	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Plate #1	419 to 335.9	83.1	0.500	0.486	97.2%
Plate #2	327 to 239.8	87.2	0.500	0.471	94.2%
Plate #3	235 to 146.4	88.6	0.563	0.554	98.4%
Plate #4	143 to 38	105	0.750	0.737	98.3%
Plate #5	35 to 14.3	20.7	0.875	0.866	99.0%

⁽¹⁾ All scan widths were 15 inches.

Table 10-3. Summary of Primary Tank Vertical Weld Scans (via Riser 031)

Weld Description	Elevation of Weld Scan (inches)	Weld Scan Distance (inches) (1)	Design Nominal (inches)	Mini	Measured Minimum (inches) ⁽²⁾		Scan Minimum % of Nominal ⁽²⁾	
Vertical Weld Plate #2	327 to 237.4	89.6	0.500	North 0.473	<u>South</u> 0.501	<u>North</u> 94.6%	South 100.2%	
Vertical Weld Plate #3	235 to 144.6	90.4	0.563	0.541		96.1%		
Vertical Weld Plate #4	143 to 37.5	105.5 ⁽³⁾	0.750	0.737		98.3%		
Vertical Weld Plate #5	35 to 13.4	21.6 (4)	0.875	0.8	344	96.	5%	

⁽¹⁾ Scan widths were 11.2 - 11.6 inches.

Table 10-4. Summary of Plate #5 / Knuckle Horizontal Weld Scans (via Riser 031)

Weld Description	Vertical Location of Weld Scan	Weld Scan Distance (inches) (1)	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Horizontal Weld Plate #5 to Knuckle, Plate-side	From ~1 in. to ~5 in. above Plate #5 / Knuckle Weld	240.0	0.875	0.838	95.8%
Horizontal Weld Plate #5 to Knuckle, Knuckle-side	From ~1 in. to ~5 in. below Plate #5 / Knuckle Weld	240.0	0.938	0.887	94.6%

⁽¹⁾ Scan widths were 9.8 – 10.0 inches.

Tables 10-5 through 10-14 contain the detailed data for wall scans as presented in 12 inch long by 15 inch wide connecting scans. The detailed data for vertical and horizontal welds are presented in 12 inch long by 9.8 to 11.6 inch wide scans in Tables 10-15 through 10-21.

^{(2) &}quot;North" and "South" indicate the north and south sides of the Pate #2 vertical weld respectively. The south plate was significantly thicker than the north plate, so the thickness measurements were reported separately instead of averaged together.

⁽³⁾ Gouge observed in the weld heat-affected zone, measuring 1.42 inches in length.

⁽⁴⁾ Linear indication detected in the weld heat-affected zone, measuring 2.92 inches in length.

Table 10-5. Primary Tank Vertical Wall Scan 1 - Plate 1 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
100	416	0 – 12 ⁽¹⁾	0.500	0.507	0.491
	404	12 – 24	0.500	0.510	0.494
Scan "Vert. Wall /	392	24 – 36	0.500	0.511	0.497
Plate 1"	380	36 – 48	0.500	0.513	0.500
(Page Att. 2-3)	368	48 – 60	0.500	0.513	0.506
	356	60 – 72	0.500	0.513	0.504
	344	72 – 83.7	0.500	0.511	0.501

⁽¹⁾ Scan start was 4 inches below the centerline of the first horizontal weld, and centerline of 24 inch Riser 031; Scan width was 15 inches.

Table 10-6. Primary Tank Vertical Wall Scan 1 - Plate 2 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
-	327	0 – 12 (1)	0.500	0.500	0.495
	315	12 – 24	0.500	0.501	0.497
Cl	303	24 – 36	0.500	0.502	0.498
Scan "Vert. Wall / Plate 2"	291	36 – 48	0.500	0.502	0.488
(Page Att. 2-5)	279	48 – 60	0.500	0.502	0.495
	267	60 – 72	0.500	0.501	0.484
	255	72 – 84	0.500	0.500	0.482
	243	84 – 87.6	0.500	0.499	0.483

⁽¹⁾ Scan start was 1 inch below the centerline of the second horizontal weld, and centerline of 24 inch Riser 031; Scan width was 15 inches.

Table 10-7. Primary Tank Vertical Wall Scan 1 - Plate 3 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
	235	0 – 12 ⁽¹⁾	0.563	0.578	0.559
	223	12 – 24	0.563	0.581	0.552
0 407 4 77 11 /	211	24 – 36	0.563	0.585	0.572
Scan "Vert. Wall / Plate 3"	199	36 – 48	0.563	0.585	0.581
(Page Att. 2-7)	187	48 – 60	0.563	0.585	0.570
	175	60 – 72	0.563	0.583	0.571
	163	72 – 84	0.563	0.581	0.566
	151	84 – 88.2	0.563	0.580	0.550

⁽¹⁾ Scan start was 1 inch below the centerline of the third horizontal weld, and centerline of 24 inch Riser 031; Scan width was 15 inches.

Table 10-8. Primary Tank Vertical Wall Scan 1 - Plate 4 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
	143	0 – 12 (1)	0.750	0.770	0.763
	131	12 – 24	0.750	0.773	0.769
	119	24 – 36	0.750	0.775	0.772
Scan "Vert. Wall /	107	36 – 48	0.750	0.775	0.770
0°s / Plate 4"	95	48 – 60	0.750	0.773	0.757
(Page Att. 2-9)	83	60 – 72	0.750	0.771	0.766
	71	72 – 84	0.750	0.767	0.750
	59	84 – 96	0.750	0.764	0.757
	47	96 – 105.3	0.750	0.758	0.739

⁽¹⁾ Scan start was 1 inch below the centerline of the fourth horizontal weld, and centerline of 24 inch Riser 031; Scan width was 15 inches.

Table 10-9. Primary Tank Vertical Wall Scan 1 - Plate 5 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / Plate 5"	35	0 – 12 (1)	0.875	0.875	0.871
(Page Att. 2-11)	23	12 – 20.8	0.875	0.877	0.869

⁽¹⁾ Scan start was 1 inch below the centerline of the fifth horizontal weld, and centerline of 24 inch Riser 031; Scan width was 15 inches.

Table 10-10. Primary Tank Vertical Wall Scan 2 - Plate 1 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
	419	0 – 12 (1)	0.500	0.506	0.486
	407	12 – 24	0.500	0.508	0.503
Scan "Vert. Wall /	395	24 – 36	0.500	0.510	0.503
2 nd / Plate 1"	383	36 – 48	0.500	0.510	0.499
(Page Att. 2-13)	371	48 – 60	0.500	0.510	0.505
	359	60 – 72	0.500	0.507	0.503
	347	72 – 83.1	0.500	0.505	0.499

⁽¹⁾ Scan start was 1 inch below the centerline of the first horizontal weld, and 17 inches south of Scan 1, centerline to centerline; Scan width was 15 inches.

Table 10-11. Primary Tank Vertical Wall Scan 2 - Plate 2 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
	327	0 – 12 (1)	0.500	0.490	0.486
	315	12 – 24	0.500	0.492	0.481
Scan "Vert. Wall /	303	24 – 30.1	0.500	0.492	0.481
2 nd / Plate 2 &	297	0 – 12 (2)	0.500	0.492	0.488
Plate 2A"	285	12 – 24	0.500	0.494	0.478
(Page Att. 2-15)	273	24 – 36	0.500	0.494	0.477
	261	36 – 48	0.500	0.492	0.475
	249	48 – 57.2	0.500	0.490	0.471

⁽¹⁾ Scan start was 1 inch below the centerline of the second horizontal weld, and 17 inches south of Scan 1, centerline to centerline; Scan width was 15 inches.

Table 10-12. Primary Tank Vertical Wall Scan 2 - Plate 3 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) ⁽¹⁾	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
	235	0 – 12 (1)	0.563	0.580	0.554
	223	12 – 24	0.563	0.585	0.556
Scan "Vert. Wall /	211	24 – 36	0.563	0.585	0.572
2 nd / Plate 3 &	199	36 – 44.5	0.563	0.586	0.579
3A"	190.6	$0-12^{(2)}$	0.563	0.585	0.578
(Page Att. 2-17)	178.6	12 – 24	0.563	0.582	0.570
	166.6	24 – 36	0.563	0.580	0.576
	154.6	36 – 44.2	0.563	0.579	0.565

⁽¹⁾ Scan start was 1 inch below the centerline of the third horizontal weld, and 17 inches south of Scan 1, centerline to centerline; Scan width was 15 inches.

⁽²⁾ Start of scan is @ 30.0 inches of previous scan; Scan width was 15 inches.

⁽²⁾ Start of scan is @ 44.4 inches of previous scan; Scan width was 15 inches.

Table 10-13. Primary Tank Vertical Wall Scan 2 - Plate 4 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
	143	0 – 12 (1)	0.750	0.765	0.750
	131	12 – 24	0.750	0.770	0.757
	119	24 - 30.8	0.750	0.772	0.767
Scan "Vert. Wall /	112.3	0 – 12 (2)	0.750	0.772	0.767
2 nd / Plate 4 &	100.3	12 – 15.6	0.750	0.771	0.765
4A & 4B"	96.8	0 – 12 (3)	0.750	0.770	0.764
(Page Att. 2-19)	84.8	12 – 24	0.750	0.770	0.761
	72.8	24 – 36	0.750	0.765	0.760
	60.8	36 – 48	0.750	0.761	0.753
	48.8	48 – 58.8	0.750	0.755	0.737

⁽¹⁾ Scan start was 1 inch below the centerline of the third horizontal weld, and 17 inches south of Scan 1, centerline to centerline; Scan width was 15 inches.

Table 10-14. Primary Tank Vertical Wall Scan 2 - Plate 5 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / 2 nd / Plate 5"	35	0 – 12 (1)	0.875	0.876	0.866
(Page Att. 2-21)	23	12 – 20.7	0.875	0.877	0.868

⁽¹⁾ Scan start was 1 inch below the centerline of the fifth horizontal weld, and 17 inches south of Scan 1, centerline to centerline; Scan width was 15 inches.

⁽²⁾ Start of scan is @ 30.7 inches of previous scan; Scan width was 15 inches.

⁽³⁾ Start of scan is @ 15.5 inches of previous scan; Scan width was 15 inches.

Table 10-15. Primary Tank Vertical Wall Weld Scan - Plate 2 (via Riser 031)

Scan I.D. Number	Elevation of Start of Weld Scan	Vertical Location of Weld Scan	Design Nominal (inches)	Nominal	Ave	sured rage es) ⁽²⁾	Mini	sured mum es) ⁽²⁾
(Data Sheets)	(inches)	(inches)	(menes)	North	South	North	South	
	327	0-12 (1)	0.500	0.495	0.525	0.473	0.510	
	315	12 – 24	0.500	0.495	0.528	0.474	0.520	
Scan	303	24 – 36	0.500	0.496	0.525	0.483	0.519	
"Vert. Weld / Plate 2"	291	36 – 48	0.500	0.496	0.521	0.490	0.519	
(Pages Att. 2-23	279	48 – 60	0.500	0.496	0.520	0.473	0.512	
& Att. 2-24)	267	60 – 72	0.500	0.496	0.519	0.482	0.514	
	255	72 – 84	0.500	0.495	0.513	0.484	0.501	
	243	84 – 89.6	0.500	0.490	0.510	0.483	0.502	

⁽¹⁾ Scan start was 1 inch below the centerline of the second horizontal weld; Scan width was 11.2 inches.

Table 10-16. Primary Tank Vertical Wall Weld Scan - Plate 3 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Weld Scan (inches)	Vertical Location of Weld Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
	235	0 – 12 (1)	0.563	0.560	0.544
	223	12 – 24	0.563	0.560	0.541
Scan	211	24 – 36	0.563	0.565	0.559
"Vert. Weld /	199	36 – 48	0.563	0.565	0.549
Plate 3"	187	48 – 60	0.563	0.567	0.549
(Page Att. 2-27)	175	60 – 72	0.563	0.568	0.550
	163	72 – 84	0.563	0.569	0.561
	151	84 – 90.4	0.563	0.570	0.558

⁽¹⁾ Scan start was 1 inch below the centerline of the third horizontal weld; Scan width was 11.6 inches.

^{(2) &}quot;North" and "South" indicate the north and south sides of the vertical weld respectively. The south plate was significantly thicker than the north plate, so the thickness measurements were reported separately instead of averaged together.

Table 10-17. Primary Tank Vertical Wall Weld Scan - Plate 4 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Weld Scan (inches)	Vertical Location of Weld Scan (inches)	Design Nominał (inches)	Measured Average (inches)	Measured Minimum (inches)
	143	0 – 12 (1)	0.750	0.770	0.752
	131	12 – 24	0.750	0.770	0.748
	119	24 – 36	0.750	0.780	0.751
Scan "Vert. Weld /	107	36 – 48	0.750	0.770	0.751
Plate 4"	95	48 – 60	0.750	0.775	0.754
(Page Att. 2-30)	83	60 – 72	0.750	0.770	0.754
-	71	72 – 84	0.750	0.770	0.760
	59	84 – 96	0.750	0.765	0.754
	47	96 – 105.5	0.750	0.765	0.737

⁽¹⁾ Scan start was 1 inch below the centerline of the fourth horizontal weld; Scan width was 11.3 inches.

Table 10-18. Primary Tank Vertical Wall Weld Scan - Plate 5 (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Start of Weld Scan (inches)	Vertical Location of Weld Scan (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Weld/	35	0 – 12 (1)	0.875	0.865	0.852
Plate 5" (Page Att. 2-34)	23	12 – 21.6	0.875	0.862	0.844

⁽¹⁾ Scan start was I inch below the centerline of the fifth horizontal weld; Scan width was 11.4 inches.

Table 10-19. Primary Tank Vertical Wall Weld Scan Flaws - Plates 4 and 5 (via Riser 031)

Scan I.D. Number (Data Sheets)	Flaw Description	X ₁ (inches)	X ₂ (inches)	Length (inches)	Width (1) (inches)	Remarks
Scan "Plate 4 / Gouge A" (Page Att. 2-33)	Gouge	1.95	3.37	1.42	-0.150	Shallow O.D. gouge < 0.100"; Not a crack-like indication; No extension through wall.
Scan "Vert. Weld / Plate 5" (Page Att. 2-35)	Linear Indication	5.18	8.1	2.92	-2.03	Indeterminate whether the indication was inner-diameter connected or if it was in the weld; Additional evaluation required.

⁽¹⁾ Y-coordinate value.

RPP-13802, Rev. 0

Table 10-20. Primary Tank Horizontal Weld - Plate 5 to Knuckle Scan, Plate Side (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Horizontal Weld Scan (inches)	Horizontal Location of Weld Scan, Plate Side (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
		0 – 12 (1)	0.875	0.869	0.854
		12 – 24	0.875	0.870	0.864
		24 – 36	0.875	0.870	0.852
Scan	From ~1 in. to	36 – 48	0.875	0.870	0.859
"Horz. Weld/	~4.9 in. above	48 – 60	0.875	0.870	0.864
Knuckle"	Plate #5 / Knuckle Weld	60 – 72	0.875	0.870	0.862
(Page Att. 2-37)		72 – 84	0.875	0.870	0.865
		84 – 96	0.875	0.870	0.864
		96 – 108	0.875	0.870	0.863
		108 - 120	0.875	0.870	0.862
		0-12 (2)	0.875	0.856	0.852
		12 – 24	0.875	0.854	0.852
		24 – 36	0.875	0.854	0.852
Scan	From ~1 in, to	36 – 48	0.875	0.854	0.852
"Horz. Weld /	~5.0 in. above	48 – 60	0.875	0.853	0.847
KnuckleA"	Plate #5 /	60 – 72	0.875	0.853	0.850
(Page Att. 2-39)	Knuckle Weld	72 – 84	0.875	0.853	0.851
		84 – 96	0.875	0.851	0.844
		96 – 108	0.875	0.850	0.846
		108 - 120	0.875	0.848	0.838

⁽¹⁾ Start of scan @ next to the air tube south of 24 inch riser; Scan width was 9.8 inches.

⁽²⁾ Start of scan @ end of scan Horz. Weld / Knuckle; Scan width was 10.0 inches.

RPP-13802, Rev. 0

Table 10-21. Primary Tank Horizontal Weld - Plate 5 to Knuckle Scan, Knuckle Side (via Riser 031)

Scan I.D. Number (Data Sheets)	Elevation of Horizontal Weld Scan (inches)	Horizontal Location of Weld Scan, Knuckle Side (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
		0 – 12 (1)	0.938	0.937	0.919
		12 – 24	0.938	0.935	0.901
		24 – 36	0.938	0.938	0.929
Scan	From ~1 in. to	36 – 48	0.938	0.940	0.926
"Horz. Weld /	~4.9 in. below	48 – 60	0.938	0.945	0.929
Knuckle"	Plate #5 / Knuckle Weld	60 – 72	0.938	0.948	0.924
(Page Att. 2-38)		72 – 84	0.938	0.950	0.923
		84 – 96	0.938	0.948	0.919
		96 – 108	0.938	0.950	0.941
		108 - 120	0.938	0.950	0.901
		0 – 12 (2)	0.938	0.940	0.927
		12 – 24	0.938	0.937	0.887
		24 – 36	0.938	0.935	0.922
Scan	From ~1 in, to	36 – 48	0.938	0.935	0.921
"Horz. Weld/	~5.0 in. below	48 – 60	0.938	0.934	0.914
KnuckleA"	Plate #5 / Knuckle Weld	60 – 72	0.938	0.934	0.920
(Page Att. 2-40)		72 – 84	0.938	0.935	0.928
	[84 – 96	0.938	0.935	0.916
		96 – 108	0.938	0.936	0.926
		108 - 120	0.938	0.938	0.906

⁽¹⁾ Start of scan @ next to the air tube south of 24 inch riser; Scan width was 9.8 inches.

⁽²⁾ Start of scan @ end of scan Horz. Weld / Knuckle; Scan width was 10.0 inches.

This page intentionally left blank

11.0 EVALUATION OF INSPECTION RESULTS

The results from the inspection of tank 241-AP-103 are evaluated and compared with results of all other tank ultrasonic inspections.

11.1 TANK 241-AP-103 UT DATA EVALUATION

The UT P-scan data were interpreted by W. H. Nelson, COGEMA Engineering's Level III certified inspector, and J. B. Elder, an independent Level III certified NDE Inspector. Mr. Elder independently evaluated the P-scan raw data and concurred with COGEMA Engineering's interpretation (Attachment 2). The P-scan data have also been evaluated by PNNL as a third party review. Their results and conclusions were found to be consistent with those described in this report. Their P-scan data review is *Ultrasonic Examination Of Double-Shell Tank 241-AP-103 Examination Completed April 2003*, PNNL report number PNNL-14300, Rev. 0 (Attachment 3).

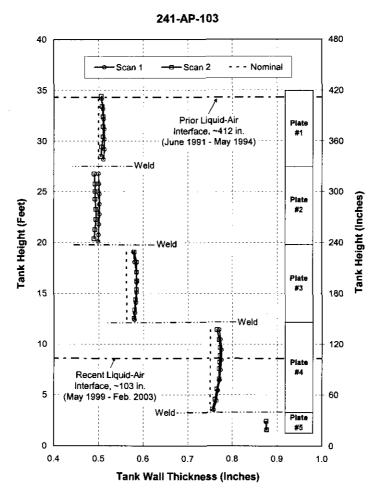
The results of the tank 241-AP-103 UT inspection of the primary tank vertical walls indicated no reportable wall thinning, no pit-like indications, and no cracking. However, inspections of the weld heat-affected zones resulted in the observation of a gouge and the detection of a linear indication, both of which are discussed in more detail below.

Figure 11-1 shows the "as-found" average thickness measurements of the primary tank vertical walls generated from the Inspection Data Sheets (Attachment 2). Each wall thickness measurement plotted on Figure 11-1 is the average of all data collected over a 12 inch long by 15 inch wide scan area. Areas of interest for tank 241-AP-103 are the vapor space above the current liquid waste, the current liquid-vapor interface, the liquid region, and any additional historical liquid-vapor interface regions. From May 1999 to February 2002, the liquid waste level was at approximately 103 inches (8.6 feet); and during the period from June 1991 to May 1994, the level remained relatively constant at approximately 412 inches (34.3 feet). There is no evidence of any significant general thinning in any of these regions.

The UT data show that the primary tank average wall thickness values generally exceeded the nominal values specified in the design documents (the exception being scan 2 on Plate #2, which was, on average, 0.008 inches below the nominal value). The UT data, when compared to construction specifications, drawings, standards, and codes (241-AP Double-Shell Tanks Integrity Assessment Report, Jensen 1999), reveal that the as-found condition of the tank plates and welds are all within the allowable design limits. A summary of the results associated with the areas examined is presented below.

Primary Tank Wall: Two vertical strips encompassing Plates #1 through #5 were examined. The overall average wall thickness for each plate vertical scan varied by a maximum of 0.016 inches from plate to plate (for same nominal-thickness plates). The overall average wall thickness varied by as much as 0.009 inches within the same plate. All overall plate wall averages encompassing both scans were between 0.004 inches less than to 0.018 inches greater than their nominal plate thickness values. No reportable wall thinning, pitting indications or crack-like indications were found.

Figure 11-1. Scan Data Average Wall Thickness Compared to Nominal Plate Thickness

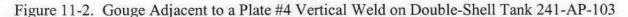


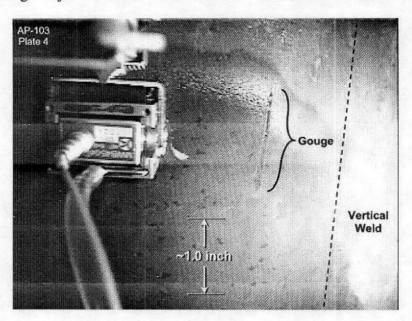
Primary Tank Welds: One vertical weld in each of the four lower Plates #2 through #5 was examined. There were no reportable wall thinning nor reportable pitting indications detected in any of the weld heat-affected zones. The plate walls adjacent to the welds averaged 0.012 inches less than to 0.021 inches greater than their nominal plate thickness values.

There was one linear indication detected in the weld heat-affected zone of the Plate #5 vertical weld (refer to the Figure 10-1 schematic for approximate location). The linear indication measured 2.92 inches in length, but further analyses were inconclusive regarding specifics of the indication. It was indeterminate whether it was an inner-diameter (ID) connected linear indication or if it was in the weld.

A follow-up inspection using different available techniques and evaluation methods will be required to more precisely characterize the linear indication. Based on the results of the follow-up inspection, it may then be established if the linear indication is in the weld, if it is ID connected, and if it is a reportable indication (depth exceeding 0.100 inches). At that time, an assessment regarding the integrity of the tank can be made and a decision regarding subsequent inspection intervals can be formulated.

Also, during the course of the UT weld examinations, the inspector observed a small gouge on an area of Plate #4, just above the Plate #4 / Plate #5 horizontal weld and approximately 1 inch north of the vertical weld (see Figure 10-1). The area depicting the gouge, captured from the inspection video, is shown in Figure 11-2.





The gouge is approximately 1.42 inches long. A review of the UT scan data for the area revealed that the gouge is shallow (less than 0.100 inches), it is not a crack-like indication, and it does not extend through the wall. The gouge was most likely caused during tank construction activities. The gouge does not appear to pose any threat to the tank integrity, based on the tank wall thickness measurements and the lack of any detectable cracks in the vicinity of the gouge. Nevertheless, it is recommended that this area be monitored during subsequent tank inspections.

Primary Tank Knuckle-to-Shell Weld: Twenty feet of the horizontal knuckle-to-shell weld were examined. No crack-like indications were found. There were also no reportable wall thinning or pitting indications found. The plate walls adjacent to the weld averaged 0.014 inches less than (plate side) to 0.002 inches greater than (knuckle side) than their nominal plate thickness values.

11.2 DST ULTRASONIC INSPECTION DATA RESULTS COMPARISON

The following Tables 11-1 and 11-2 provide a summary of primary tank vertical wall inspection results and a comparison of primary tank wall thinning.

Table 11-1 reports the inspection results chronologically according to fiscal year (October 1 through September 30).

Table 11-1. Double-Shell Tanks Chronological Inspection Results Findings

Tank	Inspection Year (FY)	Reportable Plate Crack Indication	Reportable Plate Pitting		
AW-103	1997	None	None	None	None
AN-107	1998	None	None	None	None
AN-106	1999	None	None	None	None
AN-105	1999	None	None		
AZ-101	1999	None	None	One area of a plate (11.4% maximum reduction in thickness)	None
AY-102	1999	None	None	None	None
AP-107	2000	None	None	None	None
AP-108	2000	None	None	None Two minute areas of a plate (13.8% maximum reduction in thickness).	
AW-101	2001	None	None A pit like indication in a very minute area of a plate (16% maximum reduction in thickness).		None
AW-105	2001	None	None	None None	
AY-101	2001	None	Pit-like indication at historical liquid-air interface	at historical identified as thinning	
AN-102	2001	None	None One minute area of a plate (11% maximum reduction in thickness)		None
AN-101	2002	None	None	One small area of a plate (12 % maximum reduction in thickness)	Four local areas near vertical welds (14% maximum reduction in thickness)

(Cont. on next page)

Table 11-1. (Cont.) Double-Shell Tanks Chronological Inspection Results Findings

Tank	Inspection Year (FY)	Reportable Plate Crack Indication	Reportable Plate Pitting	Reportable Plate Thinning	Reportable Weld Thinning, Pitting or Cracking
AW-106	2002	None	None	One small area	10.4% maximum reduction in thickness
AY-101	2002	Not Investigated	None	72 areas of >10% wall thinning, most in the historical liquid-air interface in Plate #2 (20.2% maximum reduction in thickness)	Not Investigated
AW-104	2002	None	None	None	None
AW-102	2002 & 2003 ^(c)	None	None	None	None
AN-105	2002	None	None	None	Not Investigated
AP-101	2003	None	None	None	None
AP-105	2003	None	None	None	None
AP-103	2003	None	None	None	TBD (d)

⁽a) Based on a review of the tank 241-AN-105 data gathering technique in FY 1999, prompted by the FY 2002 results, the FY 1999 wall thinning data is considered questionable.

The inspection results in Table 11-1 show that the overall condition of the inspected tanks is satisfactory. Defects or minute reportable localized plate thinning may be due to various reasons, such as fabrication defects, construction damage or in-service corrosion.

Wall thickness data gathered from ultrasonic examination of nineteen DSTs were compared to evaluate the degree of wall thinning that may have occurred among the tanks examined. These wall thickness data do not allow a direct calculation of wall thinning, since no measurements were made of original plate thickness values at the time of construction. However, wall thickness data from ultrasonic testing may be compared to the specified nominal plate thickness. This assessment used the minimum wall thickness in each scanning area (generally 12 inch by 15 inch) from the vertical wall scans and then calculated the average for each plate using the minimum thickness values.

Table 11-2 provides a summary of wall thinning, defined as nominal plate thickness minus average minimum plate thickness³, by nominal plate size, and by DST examined. The negative

⁽b) Although below reporting criteria at the time, one linear crack-like indication 6 inch long by 0.142 inch deep in a nominal 0.750 inch thick plate was observed. Subsequent examination of tank 241-AP-108 in FY 2002 revealed no change in size.

⁽c) Primary knuckle examination using T-SAFT conducted in FY 2003.

⁽d) One linear crack-like indication 2.92 inches long in the weld heat-affected zone of a nominal 0.875 inch thick plate was detected. A follow-up inspection is required to determine if the indication is in the weld, if it is ID connected, and if it is reportable.

Average minimum plate thickness is defined as the average of all the minimum measured thickness values for each scanning area (generally 12 inch by 15 inch) for a given plate size and DST.

values in the table indicate where the average of all minimum values of plate thickness exceeds nominal plate thickness. The Table also provides the calculated average wall thinning and associated standard deviation by DST examined for all nominal plate thickness values, and by nominal plate thickness for all DSTs examined.

Tank 241-AP-103 did not exhibit any significant thinning, with only the 0.500 inch thick Plates #1 & #2 and the 0.875 inch thick Plate #5 minimum values averaging slightly below (0.008 inches and 0.007 inches respectively) the nominal plate thickness values.

Table 11-2. Tank Wall Thinning By Nominal Plate Size

ъст	DST FY		Wall	Thinning* E	y Nominal 1	Plate Size (I	nches)	
DS1	Examined	0.375"	0.500"	0.5625"	0.750"	0.875"	AVG	STD DEV
AN-101	2002	n/a	0.008	n/a	0.027	0.015	0.013	0.014
AN-102	2001	n/a	0.004	n/a	0.003	0.005	0.004	0.016
AN-105	1999	n/a	0.026	n/a	0.007	0.001	0.019	0.032
AN-105	2002	n/a	0.015	n/a	n/exam.	n/exam.	0.015	0.021
AN-106	1999	n/a	0.006	n/a	0.015	0.012	0.009	0.009
AN-107	1998	n/a	-0.018	n/a	-0.015	0.013	-0.016	0.017
AP-101	2003	n/a	-0.008	-0.003	-0.002	0.010	-0.004	0.008
AP-103	2003	n/a	0.008	-0.004	-0.009	0.007	0.000	0.012
AP-105	2003	n/a	0.004	-0.006	-0.002	0.010	0.000	0.009
AP-107	2000	n/a	-0.011	-0.012	-0.017	-0.013	-0.013	0.008
AP-108	2000	n/a	-0.017	-0.012	-0.011	-0.005	-0.014	0.016
AW-101	2001	n/a	0.008	n/a	0.014	0.020	0.010	0.013
AW-102	2002	n/a	-0.019	n/a	-0.006	0.008	-0.014	0.012
AW-103	1997	n/a	-0.010	n/a	-0.005	0.004	-0.007	0.008
AW-104	2002	n/a	-0.036	n/a	-0.031	-0.007	-0.033	0.011
AW-105	2001	n/a	0.000	n/a	0.008	-0.003	0.002	0.018
AW-106	2002	n/a	-0.004	n/a	0.015	0.000	0.001	0.016
AY-101	2001	-0.011	0.030	n/a	0.018	0.012	0.030	0.029
AY-102	1999	-0.021	0.001	n/a	0.008	n/a	0.000	0.012
AZ-101	1999	0.021	0.027	n/a	0.020	0.003	0.024	0.011
	AVG:	-0.006	0.000	-0.008	0.003	0.005		
STD	DEV:	0.020	0.023	0.008	0.019	0.012	10164	

^{*} Thinning = nominal plate size - minimum thickness

n/a - not applicable; n/exam. - not examined

12.0 FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The findings, conclusions, and recommendations from the UT inspection of DST 241-AP-103 are listed below.

- No reportable wall thinning was detected in any of the plate areas examined. The primary wall vertical scans (Plates #1 through #5) yielded average wall thickness values that generally exceeded the nominal values. Over one-half of the average minimum wall thickness values for the plates exceeded the nominal values. Of the 12 inch long vertical wall plate scans yielding minimums falling below the nominal values, the greatest deviation was 5.8% below the nominal (where reportable wall thinning is defined as greater than 10% below the nominal).
- There was one linear indication detected in the weld heat-affected zone of the Plate #5 vertical weld. The linear indication measured 2.92 inches in length, but it was indeterminate whether the linear indication was ID connected or if it was in the weld. It is recommended that a follow-up inspection using different available techniques and evaluation methods be performed before the end of FY 2004 to more precisely characterized the linear indication. Based on the results of this follow-up inspection, an assessment regarding the integrity of the tank can be made and a decision regarding subsequent inspection intervals can be formulated (a recent Tank Integrity Assessment Project DST Lifecycle Schedule indicates that tank 241-AP-103 is scheduled for its second UT examination in about nine years).
- The primary tank vertical weld scans (Plates #2 through #5) and the knuckle-to-shell horizontal weld scan (Plate #5 to lower knuckle) yielded overall average wall thickness values that ranged from 0.014 inches below to 0.021 inches above the nominal values. There were no reportable wall thinning indications in any of the heat-affected zones, with the minimum wall thickness values ranging from 5.4% below to 0.2% above the nominal values. In addition, there were no reportable pitting indications detected in any of the weld heat-affected zones.
- A small gouge, 1.42 inches long, was observed on an area of Plate #4, just above the Plate #4 / Plate #5 horizontal weld and approximately 1 inch north of the vertical weld. The gouge does not appear to pose any threat to the tank integrity, based on the tank wall thickness measurements and the lack of any detectable cracks in the vicinity of the gouge. It is recommended that this area be monitored during subsequent tank inspections.

This page intentionally left blank.

13.0 REFERENCES

- Bandyopadhyay, K. K., S. Bush, M. Kassir, B. Mather, P. Shewmon, M. Streicher, B. Thompson, D. van Rooyen, and J. Weeks. 1997. Guidelines for Development of Structural Integrity Programs for DOE High-Level Waste Storage Tanks, BNL-52527, Brookhaven National Laboratory, Upton, New York.
- Braun-Hanford, 1986, *Tank Cross Section 241-AP Tanks*, H-2-90534, Rev. 3, Braun-Hanford Co., Richland, Washington.
- Brevick, C. H., L. A. Gaddis and S. D. Consort, 1995, Supporting Document for the Southeast Quadrant Historical Tank Content Estimate for AP-Tank Farm, WHC-SD-WM-ER-315, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- Hanlon, B. M., 2003, Waste Tank Summary Report for Month Ending March 31, 2003, HNF-EP-0182, Rev 180, CH2M HILL Hanford Group, Inc., Richland, Washington.
- Jensen, C. E. 1995. Acceptance Criteria for Non-Destructive Examination of Double-Shell Tanks, WHC-SD-WM-AP-036, Revision 0, Westinghouse Hanford Company, Richland, Washington.
- Jensen, C. E., 1999, 241-AP Double-Shell Tanks Integrity Assessment Report, HNF-4958, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.
- Jensen, C. E., 2000, Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks FY2000, RPP-5583, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.
- Jensen, C. E., 2000a, Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks FY2001, RPP-6839, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.
- Jensen, C. E., 2000b, *Ultrasonic Inspection Results of Double-Shell Tank 241-AP-108*, RPP-6684, Rev. 0-A, CH2M HILL Hanford Group, Inc., Richland, Washington.
- Jensen, C. E., 2002, Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks FY2002, RPP-7869, Rev. 0C, CH2M HILL Hanford Group, Inc., Richland, Washington.
- Jensen, C. E., 2002a, Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks 241-AP-108, 241-AY-101, and 241-AZ-102 FY2002, RPP-8867, Rev. 0B, CH2M HILL Hanford Group, Inc., Richland, Washington.
- Jensen, C. E., 2002b, Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks FY2003, RPP-11832, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

RPP-13802, Rev. 0

- Leshikar, G. A., 1997, Final Report Ultrasonic Examination of Tank 241-AW-103 Walls, HNF-SD-WM-TRP-282, Rev. 0, SGN Eurisys Services Corporation, Richland, Washington.
- Pfluger, D. C., 1999, Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks, HNF-2820, Rev. 2, Lockheed Martin Hanford Corporation, Richland, Washington.
- Silver, D., 2000, Administrative Order No.00NWPKW-1251, Failure to Comply with Major Milestone M-32 of the Tri-Party Agreement, Washington State Department of Ecology, Olympia, Washington.

ATTACHMENT 1

AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

(COGEMA Engineering Corporation Procedure COGEMA-SVUT-INS-007.3, Rev. 1)

UNCONTROLLED COPY

This page intentionally left blank.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

1.0 PURPOSE

This procedure establishes the method, equipment, and requirements for automated, direct contact ultrasonic (UT) straight-beam, thickness measurements, angle beam flaw detection, and sizing in carbon steel waste storage tanks utilizing the "P-scan" ultrasonic imaging system.

2.0 SCOPE

2.1 Requirements

The requirements herein are applicable to weld inspection, crack detection, sizing, wall thickness measurement, and the detection of wall thinning conditions, such as pitting, erosion, and corrosion in double shell tanks from 0.100 inches to 1.0 inches in thickness. At least one side must be accessible and the component surface to be measured must be parallel with the opposite surface. The requirements are also applicable to the automated UT detection and depth sizing of surface connected planar flaws.

2.2 Scanning

Scanning is performed using remotely controlled automatic scanners.

2.3 Examinations

Examinations shall be performed from inside the annulus of the double shell tanks.

2.4 Instructions

This procedure provides the instructions for the use of Tip Diffraction Techniques including the Absolute Arrival Time Technique (AATT), and the Relative Arrival Time Technique (RATT), for the sizing of planar flaws.

2.5 Methodology

The methodology in this procedure meets the requirements as addressed in Reference 4.1 as applicable to meet the requirements for inspection of double shell tanks.

3.0 RESPONSIBILITIES

Only certified Level II or Level III ultrasonic examiners shall interpret data to determine whether it represents relevant or non-relevant indication in accordance with the applicable specification.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Level III ultrasonic examiners shall review all data collected prior to issuing a final report.

4.0 REFERENCES

- 4.1 ASME Boiler & Pressure Vessel Code, Section V, Article 4, 1995 Edition.
- 4.2 COGEMA SV-CP-PRC-014, Qualification and Certification OF NDE Personnel.
- 4.3 COGEMA SVAD-PRC-001, Nondestructive Examination Administrative Procedure.
- 4.4 COGEMA SVUT-PRC-007, Ultrasonic Examination Procedure.
- 4.5 FORCE Institutes, P-scan System 4 Instruction Manual

5.0 PERSONNEL REQUIREMENTS

5.1 Personnel Qualifications

Personnel performing or supervising data acquisition or performing data analysis to the requirements of this procedure shall be qualified and certified to at least level II in ultrasonics in accordance with reference 4.2 or equivalent. In addition, they shall be trained in techniques for sizing stress corrosion cracking/planar flaws.

5.2 Certification Level

Personnel performing review for final acceptance of examination data shall be certified to at least level II in ultrasonics in accordance with reference 4.2 or equivalent.

5.3 Support Personnel

Personnel, whose responsibilities are limited to set-up, tear down, and track or scanner operation need not be certified. Such personnel shall possess sufficient knowledge of the equipment to satisfy the Level III examiner.

6.0 EQUIPMENT

6.1 Ultrasonic Instrument/Examination System



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

The P-scan computerized pulse-echo ultrasonic inspection system shall be used. The system shall be equipped with a stepped gain control in units of 1dB with a dynamic range of at least 115 dB, capable of generating and receiving frequencies in the range of 0.5 to 15 MHz. The following components may be used:

PS-4	P-scan processor
Analysis computer	Off-line data analysis with P-scan analysis software
Digital Controller, WSC-2S, or other approved scan controller	Automatic scanner controller
AWS-5, AWS5-D, RUTI*	Automatic P-scan scanner
Pump	Couplant pump for P-scan system

^{*}Remote Ultrasonic Inspection (RUTI) system

6.2 Transducers

Straight-beam and angle-beam transducers with single or dual elements, with or without delay tips, may be used, provided they can be attached to and manipulated by the scanner, and can be adequately coupled to the test item with a resultant backwall signal response of at least a 2 to 1 signal-to-noise ratio. Sizes and frequencies shall be as specified for the following applications:

- 6.2.1 For high sensitivity applications such as the detection of pitting, erosion or corrosion, transducer sizes in the range of 1/4 inch to 1/2 inch, with a frequency in the range of 4.0 to 10 MHz, shall be used.
- 6.2.2 For weld inspection, detection and sizing of planar flaws that are open to the surface, angle beam transducers with a nominal angle of 45 degrees with an element size in the range of 1/4 inch to 1/2 inch, with a frequency in the range of 4.0 to 10 MHz, shall be used. Where interference from weld geometry prevents examination of the required volume with a 45-degree a 60-degree angle may be substituted.
- 6.2.3 Transducers of other angles, element sizes, modes of propagation, or frequencies outside the above ranges may be used to suit other required examination techniques.

6.3 Cables

6.3.1 Cables of any compatible type and number of connectors may be used for examination. The length shall be limited to 400 feet, or less where signal



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

degradation occurs. The same cables shall be used for calibration and examination.

6.3.2 The scanner control cable for analog scanners shall be limited to 330 feet maximum. Digitally controlled scanners shall have a maximum cable length as stipulated by the manufacture's recommendation.

6.4 Couplant

- 6.4.1 Site approved water should be used as couplant for the examination.
- 6.4.2 Couplant application should be accomplished by means of an automatic couplant delivery system whenever possible. Care should be taken to use only as much water as required, as excess water in the annulus is undesirable.

6.5 User Calibration Blocks

- 6.5.1 For general thickness measurements, or the detection of pitting, erosion, or corrosion, user calibration blocks shall be made of an acoustically similar material as that being measured. A standard step block with 0.1 inch or greater increments encompassing the nominal thickness to be measured shall be used.
- 6.5.2 For weld inspection, crack detection and sizing measurements, user calibration blocks shall be made of an acoustically similar material as that being measured. A standard notched block with 0.1 inch or greater increments encompassing the nominal thickness to be measured shall be used.

6.6 Reference Blocks

Reference blocks (e.g., Rompas, IIW, DSC) utilized for beam angle exit point determination or screen width calibration shall be of similar material composition as the component under examination.

6.7 Pulse Repetition Rate

The repetition rates are set at rates such that signal wrap-around does not occur. In addition, the rates are sufficient to pulse the transducer at least six times within the time necessary to move one-half the transducer dimension parallel to the scan direction at maximum scanning speed.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

7.0 CALIBRATION

7.1 Verification of Instrument Linearity

Instrument alignment verification for screen height and amplitude control should be performed within three (3) months prior to use of the instrument or at the beginning and end of each outage period, whichever is less. Instrument linearity verification is independent of transducer or scanner characteristics. Verification with one transducer/scanner combination is valid for any other combination. The due date for alignment verification shall be recorded on the calibration sheet.

7.2 System Parameters

The system parameters used for calibration and examination should be established as outlined in Reference 4.5 as required. The system should be operated in the T-SCAN program for thickness mapping and zero degree inspection and in the P-SCAN program for crack detection, weld inspection and/or additional evaluation.

7.3 General Requirements

- 7.3.1 Calibration shall include the <u>complete ultrasonic examination system</u>. Any change in transducers, wedges, couplants, cables, instruments, recording devices, scanners, power source, or any other parts of the examination system shall be cause for system calibration check.
- 7.3.2 If a secondary ultrasonic system is to be used, it must be calibrated before the inspection is started and not removed from the examination system during the inspection or recalibration will be required.
- 7.3.3 System calibration checks and final calibration for instrument sensitivity and sweep range shall be performed on the same block used for initial calibration using at least one reflector. These checks shall be performed:
 - a) At the start and finish of each series of examinations.
 - b) At intervals not to exceed 16 hours.
 - c) When there is a change as described in 7.3.1.
 - d) If the examiner suspects a malfunction.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

- 7.3.4 If the horizontal sweep, thickness, or "Z" positions have changed more than 5 percent of the nominal thickness, void all examinations performed after the last valid calibration verification, and reexamine the voided areas.
- 7.3.5 <u>Calibration checks</u> may be performed on either a reference block or the basic calibration block, but must include a check of the entire examination system. Calibration checks may be accomplished by static or dynamic calibration.
- 7.3.6 Simulated calibration checks may be used in lieu of calibration checks where the spread of contamination or serious time constraints would result from performing a standard calibration check. Simulated calibration will use blocks, cables, or transducers of similar types and lengths as those used for testing and will be documented on the calibration data sheet. A baseline, simulated calibration shall be performed immediately after performing the initial calibration, or after a calibration check where the entire examination system is utilized. The initial simulated calibration check values are independent of the values obtained utilizing the entire examination system. The established tolerance applies to the subsequent simulated calibration checks.
- 7.3.7 During calibration, the temperature of the calibration block should be within 25 degrees of the ambient inspection temperature.
- 7.4 Calibration Process for Thickness Mapping / T-scan

The basic process for calibration is the same for thickness mapping (T-scan), weld inspection, flaw detection, and sizing. The calibration reflectors for straight beam are the backwall reflections from a step wedge. The reflectors for angle beam transducers are the notch base and tips from a notched block. The calibration process is as follows:

- 7.4.1 Select and connect the appropriate transducer(s), input the parameters, including thickness, frequency, index delay, gates, inspection method(s), and velocity. Apply the couplant to the applicable points on the calibration standard. (Select a sufficiently thin step for detection of unexpected low reading or pits and a step greater than the maximum thickness expected).
- 7.4.2 Place the transducer(s) on the calibration step nearest to the nominal thickness of the item to be examined. Adjust the gain control to produce a reflection of 80% full screen height (FSH). Input this gain level as the reference level. Obtain a response from the other calibration points, and verify that they produce an acceptable signal. Initial calibration accuracy



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

- will be within +/- 0.010". in T-scan. Perform steps 7.4.1 and 7.4.2 for each physical transducer being used.
- 7.4.3 Position the transducer to produce a response from the smaller of the two (2) steps to be used for calibration. Using the scan menu, collect a reading from that step. The transducer may be removed from the scanner and remain stationary "static" while the scanner is manipulated to make a larger indication on the screen.
- 7.4.4 Position the transducer on the thicker step and collect data from that step. Using the level control, measure the thickness from each step. Adjust the system to read the correct thickness with index delay and velocity if needed.
- 7.4.5 Repeat these steps as required until the system is accurately measuring the thickness over the entire inspection range with each transducer/active inspection. During initial calibration, all intermediate steps within the inspection range should be confirmed.
- 7.4.6 The vital parameters used for the calibration shall be identical to the inspection parameters with the exceptions of file name(s), X, Y and Z ranges, reference level compensations, thickness, gates or comment parameters which may be adjusted as required.
- 7.4.7 At a minimum, readings from the thinnest and thickest calibration reflectors shall be recorded for each applicable transducer on the Automated Ultrasonic Thickness Calibration Sheet (Attachment 4).
- 7.5 Calibration Process for Weld Inspection / Crack Detection / P-scan
 - 7.5.1 Select and connect the appropriate transducer(s), input the parameters, including thickness, frequency, index delay, gates, inspection method(s), and velocity. Apply the couplant to the applicable points on the calibration standard. The 5%T notch on a 1" thick plate should be used to obtain the reference level.
 - 7.5.2 Manipulate the transducer to receive the maximum response from the reference notch. Adjust the gain control to produce a reflection of 80% full screen height (FSH). Input this value as the reference level. Obtain a response from the calibration reflector and verify that the response is within +/- 2dB.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

- 7.5.3 Position the transducer to produce a response from the reference reflector. Using the scan menu, collect data from that notch. The transducer may be removed from the scanner and remain stationary "static" while the scanner is manipulated to make an indication on the screen.
- 7.5.4 Use the level control to determine the peak amplitude and the position of the indication at the peak amplitude. Use index delay and velocity (if required) to adjust the system to plot the reflectors in the appropriate positions. The ID notch should plot on the ID at or near the peak amplitude.
- 7.5.5 Repeat steps 7.5.2 through 7.5.3 as required for each transducer until the system is calibrated.
- 7.5.6 The vital parameters used for the calibration shall be identical to the inspection parameters with the exceptions of file name(s), X, Y and Z ranges, reference level compensations, thickness, gates or comment parameters which may be adjusted as required.
- 7.5.7 The calibration reflector(s) and response shall be recorded for each applicable transducer on the Automated Ultrasonic P-Scan Calibration Sheet (Attachment 7).
- 7.6 Sizing Calibration for Tip Diffraction Techniques (AATT, RATT)
 - a) Select an appropriate transducer.
 - b) Select a sizing calibration block of similar thickness and material containing at least two notches of known depths.
 - c) For the AATT technique, set at least two gates, to cover the entire area of interest. The first gate in the first leg, ending just before the ID. Position the transducer on the calibration block. Alternately peak the shallow and deep signals from the notch tips (see Attachment 6). Using the index delay and velocity controls, adjust the system until the system correctly reads the remaining ligament with the "Z" cursor.
 - d) For the RATT technique, the system mode should be set to A-SCAN.

 Manipulate the transducer until signals are obtained from the shallow notch tip and the notch base simultaneously (see Figure 2, Attachment 6). Using the index delay and velocity, adjust the distance between the two signals to read the actual reflector depth in inches. Repeat the same process on the deep



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

notch. Alternate this procedure until the screen/system represents a desirable linear depth screen in inches.

e) Save the calibration, and record this data on the Automated Ultrasonic P-Scan Calibration Sheet (Attachment 7).

8.0 EXAMINATION

8.1 Surface Condition

- 8.1.1 The surface from which measurements are to be taken should be free of loose scale, unbonded coating, heavy oxidation, weld spatter, or other material which may interfere with movement of the transducer or the transmission of sound into the material.
- 8.1.2 A surface finish of 250 RMS or better should be provided. The requesting organization must approve the use of any base material preparation process, which may reduce the thickness below the allowable tolerance.

8.2 Extent of Examination

The location of the areas to be measured and/or the number of scans to be performed shall be designated by the applicable work instructions. The location, scan numbers, and reference points of all scans shall be recorded on the applicable data sheets. See attachment 1 for minimum examination volume and beam direction for weld inspection.

NOTE: Additional scan areas will not require revision to this procedure.

8.3 Flaw Location

When performing examinations to detect planar flaws, angle beam transducers shall be used. Calibration is performed as in Section 7.5. All angle beam examinations shall be performed in P-scan.

8.4 Ultrasonic Measurement

User calibration shall have been completed per the applicable requirements of Section 7.0 prior to performing any of the examinations.

8.4.1 The amplitude of the first back reflection obtained from the item to be examined shall be adjusted as necessary using the Transfer Correction to



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

maintain approximately the same amplitude as that used for calibration. The dB value obtained with straight beam transducer should be recorded on the report. This value should be considered during analysis of P-scan angle beam data also.

- 8.4.2 Transducer overlap between passes shall be a minimum of <u>50%</u> of the element size. Scanning speed shall not exceed <u>6 inches</u> per second.
- 8.4.3 Should measurements be observed larger or smaller than the range calibrated for in Section 6.0, check the calibration for accuracy in the encountered thickness range. If the calibration is accurate in this range, amend the calibration sheet and continue the examination. If the calibration is <u>not</u> within the tolerance allowed in the spec, then <u>recalibrate</u> and <u>rescan</u> all areas where readings were encountered outside the originally calibrated range.

8.5 Limitations and Precautions

- 8.5.1 Care must be taken to ensure the transducer face is flush with the examination surface during scanning.
- 8.5.2 When it is necessary to determine the origin of mid-wall indications, a 4MHz shear wave transducer(s) may be used in the P-Scan program to detect pit openings or perpendicular connections between laminar indications.

8.6 Recording

Upon completion of each scan area, the data file(s) shall be recorded on a disk. All measurements within the predetermined gated area are stored, along with the text information with each file.

8.7 General Sizing Guidelines

8.7.1 It is recognized that, of the methods of sizing described in this procedure, no one technique is completely accurate in sizing all flaws in all thicknesses. By using complementary methods, however, a realistic approximation of the flaw depth can be obtained.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

- 8.7.2 The method of sizing pits is primarily utilizing a zero degree dual element transducer. The 45-degree shear wave transducers may be used to confirm qualitatively the depth of the pit.
- 8.7.3 When sizing crack-like indications, the entire flawed area shall be scanned with the imaging mode. The entire flaw length shall be evaluated. It is recommended that A-Scans be recorded at the <u>deepest</u> location of the flaw. The primary technique for sizing crack-like indications is the high frequency, 45 degree shear wave transducer utilizing the Absolute Arrival Time Technique (AATT). The dual element, straight beam may be used as a complimentary technique.
- 8.7.4 Additional sizing technique sequences may be utilized if the primary techniques identified prove to be indeterminable.
- 8.8 Sizing with Tip Diffraction Techniques (AATT, RATT)
 - 8.8.1 The AATT technique uses shear waves to obtain a diffracted echo (satellite pulse) from the flaw tip (see Figure 1 Attachment 6). The RATT technique uses shear wave reflected signals from both the flaw tip and the flaw base (see Figure 2 Attachment 6). Both techniques can be utilized using the same transducer.

a) AATT Technique

Locate the deepest extremity of the flaw and maximize the signal from the flaw tip. The distance to the flaw tip represents the remaining material ligament from the outside surface. To determine the relative through wall flaw depth, subtract this dimension from the local material wall thickness.

b) RATT Technique

Locate the deepest extremity of the flaw, and obtain a signal from the flaw base. Manipulate the transducer until the doublet (flaw base and tip signal appearing simultaneously) is observed. These signals do not have to be peaked, as the doublet separation directly indicates the relative through wall depth. To determine remaining material ligament, subtract the relative through wall depth measurement from the local material wall thickness.

8.8.2 Other sizing techniques or variations to the techniques may be used with the approval of the UT Level Ill. Such approval, signature and a



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

description of the technique shall be recorded in the "Remarks" column on the Ultrasonic Sizing Calibration Sheet (Attachment 7).

9.0 EVALUATION

9.1 Relevant Indications

Relevant indications including pitting, thinning and crack-like indications along with the minimum thickness reading in the area of interest shall be recorded and used for evaluation per Paragraph 9.2.

- 9.1.1 P-scan data shall be evaluated to a sensitivity of 20% reference level (-14dB). All crack-like indications are recordable regardless of amplitude.
- 9.1.2 T-scan data shall be evaluated utilizing all available images to detect and evaluate indications.
- 9.1.3 Reportable indications shall be evaluated by Level III personnel prior to final report submittal.

9.2 Reporting/Special Criteria

Reporting and special notification criteria are noted in Section 9.8.

9.3 Statistical Information

The statistical information (Minimum and Mean thickness) provided under "Setup" pages 1 & 2 of the post-processing software should be reported for each "Part" of a given scan location. Where data noise invalidates these values, the analyst should determine the values using the level control.

9.4 Printouts

Printouts should be made in accordance with the customer's request. In absence of further direction, both the merged set-up pages and the merged image, adjusted to show the minimum thickness, shall be printed at a level that best shows the wear patterns or at Nominal T - 12.5%, whichever provides the most useful information. P-scan data should be printed with the level control set at 20% reference level (-14dB).



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

9.5 Recording Crack Size

- 9.5.1 All flaw sizing data acquired should be used to determine the flaw depth.

 This data shall be reported individually for each flaw and shall include all data necessary to achieve the best accuracy of flaw depth.
- 9.5.2 If, during sizing, a <u>flaw length other than that reported during the detection examination</u> is measured, or other discrepant conditions occur, record the corrected lengths, locations. or distances on the Ultrasonic P-scan Data Report (Attachment 8) in the spaces provided.
- 9.5.3 If, during sizing, the area is determined <u>not to be flawed</u>, and the resultant reflector(s) is due to component/weld geometry or metallurgical structure, the true origin (e.g., root, mismatch, etc.) shall be documented and substantiated on the Ultrasonic P-scan Data Report.

9.6 Scanning Limitations

Record all limitations due to weld configurations, obstructions, single side access restrictions, etc., in the remarks section on the applicable Ultrasonic Data Report. Details as to specific length or area in relation to L (X) and/or W (Y) reference points should be recorded.

9.7 Flaw Evaluation

Reportable indications shall be evaluated by Level III personnel prior to final report submittal.

9.8 Reporting Levels

All indications which meet or exceed the following conditions shall be reported to the project cognizant engineer.

- a) Pit depth exceeds 25% of the wall thickness.
- b) Wall thinning exceeds 10% of the wall thickness.
- c) Surface crack depths exceeding 0.18 inches.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

10.0 REPORTS

10.1 Thickness Data Reports

An Automated Ultrasonic Thickness Data Report (Attachment 3) shall be prepared for each examination or series of examinations performed. This report shall include identity of equipment, the thickness measurements obtained, and should be referenced to the calibration sheet.

10.2 Calibration Reports

An Automated Ultrasonic Examination Calibration Sheet (Attachment 4) shall be prepared for each examination or series of examinations performed. This report shall include the materials and equipment used for examination.

10.3 Sketch Sheets

An Automated Ultrasonic Examination Sketch Sheet (Attachment 5) should be prepared for each examination or series of examinations performed. This report should include identity of scanning equipment and a sketch of the component or item examined, identifying scan locations, including dimensions, reference points, and grid locations, where applicable.

10.4 Sizing Data Reports

An Ultrasonic Sizing Data Report (Attachment 8) shall be completed only when cracking is detected. Each report shall be related to the applicable Automated Ultrasonic Examination Calibration Sheet(s).

10.5 Cover Sheets

Whenever several locations are being examined on the same conponent an Automated Ultrasonic Examination Report Cover Sheet (Attachment 1) and an Automated Ultrasonic Thickness Report Summary Sheet (Attachment 2) should be completed.

10.6 Final Reports

Final reports are to be distributed and maintained in accordance with the applicable contract.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

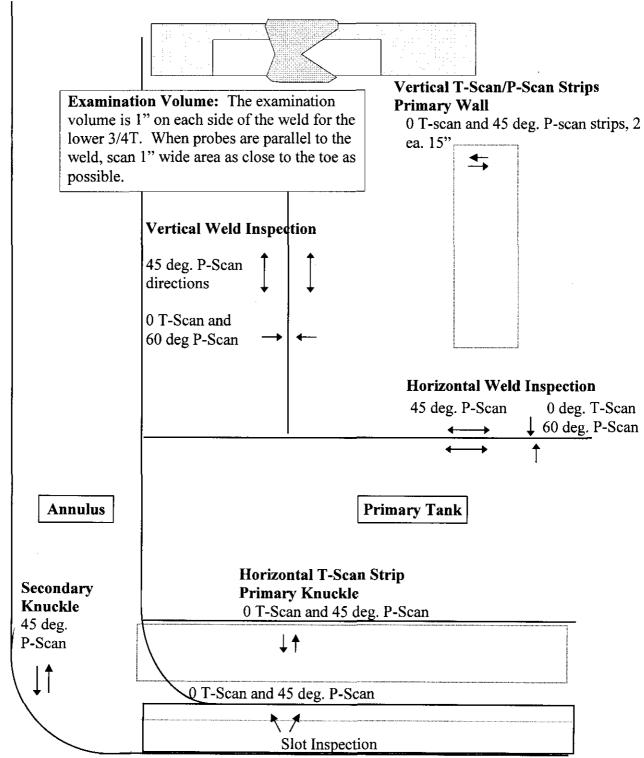
11.0 ATTACHMENTS

- 11.1 Attachment 1: Examination Volume, Minimum Beam Directions and Extent of Examination
- 11.2 Attachment 2: Sample Automated Ultrasonic Thickness Data Report
- 11.3 Attachment 3: Sample Automated Ultrasonic Thickness Calibration Sheet
- 11.4 Attachment 4: Figure 1: Absolute Arrival Time Technique (AATT) Figure 2: Relative Arrival Time Technique (RATT).
- 11.5 Attachment 5: Sample P-scan Calibration Data Sheet
- 11.6 Attachment 6: Sample Ultrasonic P-scan Data Report



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 1: Examination Volume, Minimum Beam Directions and Extent of Examination



SECONDARY BOTTOM

0 deg. T-Scan



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 1 (continued): Extent of Examination

Primary Tank Wall

<u>Vertical Strips</u> - Examine a vertical strip 30" x 35 feet long of the primary wall between the upper haunch transition and the lower knuckle for pits, cracks and wall thinning. Axial cracks on the tank inner wall surface shall be detected and sized. The vertical strip may be comprised of one or more strips whose total width is equal to 30 inches.

Weld Areas - Examine 20 feet of horizontal weld area (heat affected zone), at tank to knuckle weld. Examine one ~10 foot section of vertical weld joining the lowest shell course plates and one ~10 foot section of vertical weld joining the next to lowest shell course plates. Axial and circumferential cracks on the tank inner surface shall be detected and sized.

Primary Tank Knuckle

Examine 20 feet of the primary tank lower knuckle in the circumferential direction to detect and size cracking in the circumferential direction and to detect pits and wall thinning. The area to be examined is from the weld joining the transition plate with the knuckle to the furthest reach of the transducer assembly that is allowed by geometric constraints.

Secondary Tank

<u>Secondary Tank Lower Knuckle</u> – Examine a 20 foot length of the secondary tank knuckle over the entire area of the knuckle for the presence of circumferential cracks.

<u>Secondary Tank Bottom</u> – Examine the secondary tank bottom over an area of 10 ft² to detect and measure thickness and pits.

Primary Tank Bottom

Examine the primary tank bottom for pits, wall thinning and cracks oriented in the circumferential direction (perpendicular to the air channels) in 16 air channels. The tank bottom is to be examined for a distance of 12 feet towards the tank center, starting seven inches inboard of the outside radius of the tank cylindrical section. The primary tank bottom scan head is designed to examine the accessible area in the air channel in one pass through the channel.



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 2: Sample Automated Ultrasonic Thickness Data Report 4/00 **AUTOMATED ULTRASONIC THICKNESS DATA REPORT** SYSTEM EXAM END LOCATION EXAM START JQB# COMPONENT ID **EXAMINATION SURFACE** NOM, THICKNESS OD ID PAINTED CONFIGURATION TO TEMP ٥F CIRCUMFERENCE/TOTAL LENGTH EXAMINED REF. LEVEL CORRECTION (TRANS. CORR) DB MATERIAL TYPE
SS CS OTHER
TRANSDUCER CONDITION PROCEDURE REV FILE NAME/ITEM# ☐ DUAL ☐ SGL ☐ ODEG ☐ ANGLE Xo REF. POINT (Lo) Yo REF. POINT (Wo) SCAN WIDTH PART#/ X STOP Y START Y STOP MIN. THK, AREA COMMENTS X START AVE. INDICATION REPORTABLE THK. R. LIG. **SUMMARY REMARKS** Examiner Analyst Reviewer Page Level ____ Date_____ Level ___ Date___ Level ___ Date___ _ of _



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 3: Sample Automated Ultrasonic Thickness Calibration Sheet

4/00				TAMC		RASON	VIC THIC	KNESS			
LOCATI	ON		SYSTE		ALIDRA	TION	CALIBRATIO	ON BLOCK			
PROCE	DURE		<u> </u>			<u>.</u>	THICKNESS			MATERIAL	
UTSYS	TEM		SERIA	AL#			REFERENC	E BLOCK		<u> </u>	
SOFTW	ARE VERS	SION	<u> </u>	REV.		<u>.</u>	THICKNESS			MATERIAL	
	ITY DUE D			<u></u>	···		REFERENC	E BLOCK TEMP		PYRO SN.	<u></u>
	ER TYPE		SERIA	\1 #			COUPLANT		٥F	BATCH#	
			SERIA				ŀ			BATON#	
	ER CABLE						CABLE LEN		CABLE#		
SIGNAL	. CABLE						CABLE LEN	IGTH	CABLE #		
CHANN	EL TR/	ANSDUCER KE	MOD	EL	FREQ.	SIZE	SERIAL#	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1											
2								_			
3							-		 		
	CALIBRAT	FION	- 			1	L ALIBRATI	ON CHECKS			\
DATE							7 (2,010 (11	OIT OI LOIK	<u>. </u>		
TIME											
REFLE(TOR										
CH. 1	THK.1										
	THK. 2										
CH. 2	THK.1										
011.0	THK. 2										
CH. 3	THK.1				-						
CH. 4	THK.1										
01 1	THK. 2					· · · · ·					
FILE#	<u> </u>				 	- -					
EXAMIN	IER										<u> </u>
REMA	RKS								7014		
							***		.		
			··							· · · · · ·	
Exam	iner		E	xaminer			Reviev	ver			
LEVEL	DA	ATE	Le	evel	Date		Level	Date			



Flaw Tip and Base Signals

AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 4: Absolute Arrival Time Technique (AATT) & Relative Arrival Time Technique (RATT)

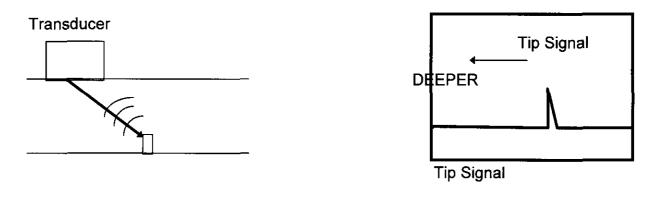


Figure 1. Absolute Arrival Time Technique



Figure 2. Relative Arrival Time Technique



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 5: Sample P-scan Calibration Sheet

4/00		AU.			D ULTR	ASON					ON			
LOCATIO	ON			SYSTI	EM			CALIB	RATIO	N BLOCK		•		
PROCE	DURE			· · · · · ·				THICK	NESS	5			MATERIAL	
UT SYS	TEM			SERI	AL#			REFE	RENC	E BLOCK				
SOFTW	ARE VEF	RSION			REV.			THICK	NESS	5			MATERIAL	
LINEARI	ITY DUE	DATE			<u> </u>	-		REFE	RENC	E BLOCK TEM		PF	PYRO SN.	
SCANNE	ER TYPE			SERI	AL#			COUP	LANT		`	<u>′Г</u>	BATCH#	
SCANNE	ER CABL	.E		-				CABL	LEN	GTH		CABLE #		
SIGNAL	CABLE							CABLE	LEN	GTH		CABLE #		
CHANN		RANSDUCE AKE	R	MOE	DEL	FREQ.	SIZE	SERIA	L#	GATE EVAL METHOD		NGLE OM./ACT.	WEDGE TYPE	IMAGE
1														
2														
3														
4													<u> </u>	
INI	ITIAL	CALIBR	ATION					CALIBR	<u>ITAS</u>	ON CHEC	KS			
DAT	Ε													
TIME	Ξ													
REFLE						_								
ORRIE CH. 1		ITUDE												
011.	LOCA													
CH. 2	AMPL	ITUDE				,				-				
	LOCA	TION												
CH. 3	AMPL	ITUDE	_											
	LOCA	TION												
CH. 4	AMPL	ITUDE												
	LOÇA	TION												
FILE	#													
EXAM					0.00					 	-			
REM				'			J					1		
	, <u>-</u>				-									
Exam	iner			E	xaminer			Re	viev	ver	•		Page	
Level		Date		Ī	evel	Date		Lev	vel _	Date_				of



AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 6: Sample P-scan Data Report 4/00 **ULTRASONIC P-SCAN DATA REPORT** SYSTEM EXAM START EXAM END JOB# LOCATION COMPONENT ID **EXAMINATION SURFACE** CONDITION ☐ OD ☐ ID ☐ PAINTED CONFIGURATION CALIBRATED RANGE TEMP ٥F REF. LEVEL CORRECTION (TRANS. CORR) CIRCUMFERENCE/TOTAL LENGTH EXAMINED DB MATERIAL TYPE PROCEDURE REV SS CS OTHER FILE NAME/ITEM# TRANSDUCER ☐ DUAL ☐ SGL ☐ ODEG ☐ ANGLE Yo REF. POINT (Wo) Xo REF. POINT (Lo) SCAN WIDTH SIZING METHOD ANGLE REFERENCE CAL. SET-UP SHEET 1 45/60 DEGREE SHEAR AATT 3 RATT **DUAL 0 DEGREE** INDICATION INFORMATION DEPTH IND METHOD WELD MAX X1 LENGTH X2 Y1 Y2 INDICATION WIDTH SIDE R. LIG. **AMP TYPE** REMARKS Examiner Analyst Reviewer Page ___ of ___ Level ___ Date____ Level ___ Date____ Level ___ Date___

ATTACHMENT 2

COGEMA "AUTOMATED ULTRASONIC THICKNESS DATA REPORT SHEETS"

This page intentionally left blank.

ATTACHMENT 3

COGEMA "AUTOMATED ULTRASONIC THICKNESS DATA REPORT SHEETS"

	····							
4/00	TUA	OMATED L			KNESS	*****		1
LOCATION :	· · · · · · · · · · · · · · · · · · ·	D/P	ATA REPO	IKI .	l. evuir	CTABT		iser # 31
LOCATION 200 EAST T	ANK FAR	N STOLEM	PSP-	4	1/27		EXAMEND 2210	103# 03-41
COMPONENT ID		03-AP)		EXAMI	NATION SURF	ACE	NOM. THICKNESS
CONFIGURATIO	PLA	7/1			1	RATED RANGS		TEMP OF
CIRCUMFERENC	CE/TOTAL LENGT	H EXAMINEO	83.7	н	REF. L	EVEL CORREC	CTION (TRANS. CO	DRR) Ø DB
CYGEMA.	-รงนา-ว	[NZ - 00.	1.3 R	EV .		IIA!. TYPE KACS O	THER	СОИВПТОИ
FILE NAME/ITEM	#				TRANS	DUCER		
V. DEE DOINT !!	्र ४ न्द्रस्ट	7, WALL	-/PCAI	15	SCAN		SL 🗶 ODEG. [ANGLE
Xa REF. POINT (I	HOPE W	19 Gr. of	24" 21	ser			19";	
PART#/ INDICATION	X START	X STOP	Y START	YSTOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0-12			<u> </u>	<u> </u>	507	14910		515"
12-24	<u> </u>	<u> </u>		ļ		,4940		1515"
24-36		<u> </u>		ļ <u>.</u>		1497		520"
36-48	<u></u>			ļ		.506"		1520"
48-60				•		15061		.528"
68-72				<u> </u>	.5131			1520*
72-83,7	<u> </u>				.SII*	,501"		.520"
	ļ	<u> </u>		<u> </u>	<u> </u>	ļ	<u> </u>	
			<u> </u>	<u> </u>			· · · · · · · · · · · · · · · · · · ·	
	<u> </u>		 	<u> </u>				
	<u> </u>	<u> </u>	<u> </u>	 				
]	 		ļ		·	·	
		ļ	 -	!		· ·		+
		<u> </u>	-	 	<u> </u>	<u> </u>		
SUMMARY			-	1	<u> </u>		<u> </u>	
COMMINICALL			1					
REMARKS		·		*				
			1 1 1 1 1 1 1					
					•			
Exemilier	1.1		Analyst Wester	1072	T	Reviewer		Page
Level II.		3 1	Level 📆	Date 2/4	2/03 I	_evel	Date	of
P-Scan L		. 13						
(UI) See At	tached	Lette-	From	Z. B. E	ilder	•		

4/00	·		· U	LTRAS DATA		P-SCAN PORT				F	255ER 31
LOCATI		bove fa	SYST	EM Po	5P-4		EXAM	START	0750 22.1		03-41
COMPO	DI TNENC				-1	· · · · ·	EXAM	INATIO	N SURFACE	CC	MOITION
CONFIG	GURATION		3 - 140 TO					RATED	□ID □ PAINTED RANGE		TEMP
CIRCUN	MEERENCE/T	OTAL LENGT	H EXAMINED			 -	REF. I	EVEL :	ン" すら / CORRECTION (TRA	474 ANS. CORF	AmB of
					<u>83,</u>			RIAL T			
	4 C C C C C C C C C C C C C C C C C C C	SVUT	~ C42-	0 <u>07</u> 1		REV		E	CS OTHER	HT	K 500
FILE NA	AME/ITEM#	VED	ך. שבו	112	LAT 8	=)	TRAN	SDUCE	R _ 6 5{\SGL □ 0D	EG 🖼	ANGLE 450
X ₀ REF	, POINT (Lo)	ez wel	Yof	EF POINT	(W ₀)	Riser	SCAN	WIDT	15"		
1 Oct	SIZING ME	THOD	A?	VGLE	RE	FERENCE C	AL. SHE	ET		SET-U	P
1 45	5/60 DEGR	EE SHEAR									
	ATT ·				-						
	UAL 0 DEC	REE	 					-			
				IN		TION INFO		ON			
IND I	METHOD	SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE
										<u> </u>	
┝╌┼╴											
								 -			
						ļ					
}										 	
											
}			· · · · · · · · · · · · · · · · · · ·								
DE.	ARKS						<u> </u>	<u> </u>		<u> </u>	
		ACK	LEKE	. Z	102	CATS	D~15		•		
									-		
Exant	iner 1.		An	alyst	2.1	777.	Re	view	er		Page
Level	II Da	e/27 o	3 E	vel your	Date	5 3 03	7	vel_	Date		of
(NI)) SEE	aTTA .	CHE C	رجر ا	Ti-v	2 Febr	7-1.	R .	ELDER		<u>.</u>

4/00	AUT	OMATED U			KNESS		·	
LOCATION		SYSTEM	TA REPO	RI	EXAM S	TABT	EXAME	Riser # 31
200 EAST T	ANK FALM		PSP-	. 4	1/28/0	3 07/5	152	
COMPONENT ID		103-A	0		EXAMIN	IATION SURF	ACE	NOM, THICKNESS
CONFIGURATION		TO		···	Calles	DO DO (ATED RANGS	_] PAINTED	.500"
	PLA	1 E	LATE.			3" 10	1.0"	Amb, of
CIRCUMFERENC				.6"	REF. LE	VEL CORREC	CTION (TRAN	 DB
COSEMA-	-SUUT-T	100 - 201	R	EV		IALTYPE TXICS O	THEN	CONDITION
FILE NAME/ITEM	<u></u>				TRANS	DUCER		<u></u>
X ₀ REF ₁ POINT (L	VERT	· WALL	PLAT	<u> </u>	54. 0	UAL SO	EL M ODEC	G ANGLE
1 pagm	Bez wel	ع افا م	SALL SIZ	er	SCAN	MD1R	15%	:
PART#1 INDICATION	X START	X STOP	YSTART	Y STOP	AVE. THK,	MIN. THK. R. LIG.	AREA REPORTAS	MAX. THK.
0-12			:		.500"			1510"
12-24				<u> </u>	.501"	,497"		1510"
24-36			<u> </u>		. 50Z"	.4980		.510"
36-48					,502"	.488"		<u>. 510"</u>
48-60			11.39.	4	,502"	1495"		15184
60-72		 			.50 ("	1484"		,5/0"
72-84					1500	.482"		1510
84-87.6					14991	,483"		.505"
		<u> </u>	1					
	j							
		T						
SUMMARY						• •		
REMARKS			.]	L	!			
	,		 : · · · · · · · · · · · · · · · · · · 	' '	1 1 1 1 1 1 1			
· · · · · · · · · · · · · · · · · · ·		·			•			
							<u>,</u>	
Examiner	1.	I A	nalyst	- ^	T F	<u>Re</u> viewer		Page
MDHG	hor		Dule	#7/1	<u> </u>	الراب		
Level D		<u>s</u> [evel VS	Date_2/4		evel	Date	of
<u>P-Scan Li</u>			·	•				
(v) See A	vitache	d rette	- Fro	m J. E	Elder	سم		

4/00	ULTRAS							ISER 31
LOCATION 200 FAST TANK FARM	SYSTEM	P-U		EXAM	START	0725 EXAM	END JO	8# 03-41
COMPONENT ID				EXAM	MNATION	SURFACE ID PAINTEE	CON	DITION
CONFIGURATION	3-AP			CALIE	RATED	HANGE		TEMP
CIRCUMFERENCE/TOTAL LENGTH EX	AMINED			REF.	LEVEL C	ORRECTION (TRA	ANS. CORR)	AmB of
PROCEDURE			REV		RIAL TY			<u>&</u>
COGEMA-SVUT-S			<u> </u>	TRAN	SDUCER	S OTHER	THIS	
1/ERT	WALL /7	MAY	E 2		DUAL	6⊠ SGL □ 0D		GLE 45°
1" below Harz weld	YOREF. POINT	24"	Riser			15		
SIZING METHOD 1 45/60 DEGREE SHEAR	ANGLE	R	FERENCE C	AL. SHE	<u> </u>		SET-UP	
2 AATT								
3 RATT								
4 DUAL 0 DEGREE	IN	DICA	TION INFO	RMAT	ION	 -		
	PTH MAX LIG. AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE
					· ·			
		_	_		ļ	_		
				<u> </u>	 -			
								
								
·					ļ			
REMARKS			L	L			<u> </u>	
NO CRACK LE	KH ZNO	عحد	ATTON	25				
	·							
	·····							· · · · · · · · · · · · · · · · · · ·
Examper	Analyst	12	Not-	Re	viewe	r	1	Page
Level II Date 1/20/03 P-SCQN Limited	Level	Date	5/13/03	~	vei	Date		of
	HED LIE	<i>1157</i> 0	L FROM	·I- 1	B.1	ENDER		

4/00	AUT	OM/	ATED U	LTRASON	VIC THIC	KNESS		- T	-i		- .
-				TA REPO		,			Pise	~ # 31	
LOCATION	TANK FARN	\Box	SYSTEM	P5P-4		EXAM:	START	EXAMEN 277	1D JOE	3-41	
COMPONENT ID	1				<u> </u>		VATION SURF			YOM, THICKNE	
CONFIGURATIO	103-	44	TO				OD DID [.5 <u>,2"</u>	
CONTIGURATION	" PLAT	E	10			- 1 .	3" TO 1	Δ"	•	AMB	٥F
CIRCUMFERENC	CE/TOTAL LENGT	H EXA	MINED	පිහි	۰2"	REF. Li	VEL CORRE	CTION (TRANS	S. CORR)	<mark>ጀ</mark> ረ DB	 3
PROCEDURE	mA-SV4T	-Z+	J5 - 0	R	EV		IAL TYPE	THER		CONDITION	1
FILE NAME/ITEM	# VEOT		مند /	PLAT	 E. 3	TRANS	OUCER	GL 🔀 ODEG	ANG	LE	
X REF. POINT	torz weld		Ye REF.	OINT (Wp)	ıser	SCAN	WIDTH	15"			
PART#/ INDICATION	X START	X S	TOP	Y START	YSTOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABL		XX. THK.	
0-12				·		.578"	.557"			590"	
12-24						.581"	·552"			5901	
24-36	,					.585 "	ราว"			595"	
36-48				<u> </u>		.585"	561			595"	
48-60]					-5851	.570*			. 595 *	
60-72	<u> </u>					.563"	. 57/*	<u></u>		.590"	
72-84			<u>.</u>			.S8I"	,566			, 590	
84-88.2						. 5రం"	.s.so"			. 590"	
						<u> </u>		<u> </u>			
				1	-			 			
			·		 	 	<u> </u>				
											
-											
SUMMARY											
REMARKS	<u>. </u>	L		.1		.L	L	L	L	·	
											
						4				·····	
Examiner	\ \ \			Analyst	.02		Reviewer			Page	
Fevel TE [Date Haglo:	 5		evel was			Level	Date		of_	
P. Scan I											

WI SEE ATTACHED LETTER FROM J. B. ELDER

4/00			l			P-SCAN PORT					F	32 <i>5</i> E	n 31
LOCA				STEM PSP-	LA		EXAN	STAF	RT	EXAM	END	JOB	
COME	PONENT ID	mk fary	,		7							CONDIT	1-03 ION
		10	3 - F	19			1 6	OD	OID OF				
CONF	IGURATION	701.05		0			CALI	BRATE	D RANGE	a	. #		TEMP Ama of
CIRCI	IMEERENCE/I	TLOTAL LENGTH	FXAMIN	FD			REE	FVE	To)	20 U.S.	ANS CC	IRR)	Amb of
				9	4.0)•				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1110. 00	······,	DB DB
PROC	EDURE	~ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		ረነለን	5	REV	MATE	RIAL	TYPE CS OTHI	-0	-10		,562"
FILE	1	-SV4T-					TDAN	ISDI IC	ED				
	1	IERT. WI	المار	12/12	- 17	3	" [DUAL	SGL	□ 00	EG 🐔	ANGL	E 45°
X ₀ ,RE	E POINT (La)		·Yo	REF. POINT	(W ₀)	^	SCAN	I WIDT	Н	15'			
ı D€	SIZING ME	Z WOLD	+	ANGLE	ᄴ	EFERENCE C	AL OUT	CT	· · · · · · · · · · · · · · · · · · ·	, ,	SET	110	
1 4	SIZING ME 45/60 DEGR		-	MINGLE	+ KI	EFERENCE C	AL. ONE	.c I			OE 1	-07	
	AATT	EE SHEAR	+										
	RATT		 										
	DUAL 0 DEC	REF	+				·		<u> </u>				
			ــــــــــــــــــــــــــــــــــــــ	41	IDICA	TION INFO	RMAT	ION	L <u></u> ,			-	
IND	METHOD		DEPTH R. LIG.	MAX	X1	LENGTH	X2	Y1	Wic	TΗ	Y2		INDICATION TYPE
								1					
								<u> </u>					
							<u> </u>	<u> </u>			<u>.</u>		
			<u> </u>					<u> </u>			ļ		
				·		 		\rightarrow					
					<u> </u>	 	ļ	 	_}>	_			
,					ļ <u>.</u>	1	 	ļ		_	—		
					 	 		 -		-		\rightarrow	
			<u> </u>	 				ļ: -			 		
REN	MARKS	<u> </u>			L	L.	<u> </u>	1			1		
		CK (ZI	<u> </u>	エンロ) Z (Y	2750NS	?				·		· · · · · · · · · · · · · · · · · · ·
	······································	·											
11	miner el Da	77/e/ te 3/10/0	2 ا بي	nalyst Vuol evel	Date	Nel 5/14/03	⟨ ∆ ⟩	eviev D evel)		Pa	age of

ND SEE ATTACARD LITTLER FROM I. B. ELDER

AUTOMATED ULTRASONIC THICKNESS DATA REPORT									
COATION 200 EAST TANK FARM SYSTEM PSP-4	4/00 AU		•		KNESS		,	RI	SER 31
COMPONENT ID 103 - AP		SYSTEM			EXAM S	TART	EXAM		08# 03-41
CONFIGURATION PLATE TO	COMPONIENT ID				EXAMIN	NATION SURF	ACE	<u> </u>	NOM, THICKNESS
REF.LEVEL CORRECTION (TRANS CORR) DB	CONFIGURATION	ŤΩ		······································		ATED RANGE		4,	TEMP
RECUEBURE TOO			١٨٩	ຸຊ "	REF. LE	VEL CORREC	CTION (TRA	NS. CORR)
FILE NAME/TEMP		T-15 - 0.5		REV	4		TUED		
Ya REF. POINT (No.) Ya REF. POINT (No.) Ya PEF. POINT (No.)	#12 # 212 A A D D D D D D D D D D D D D D D D D			A71= L)	TRANS	DUCER		:G [] AI	MG! E
PART #	Xo REF. POINT (Lo)	Yo REE	POINT (Wo)						
12-24	PART#/ X START	X STOP					AREA		MAX. THK.
12-24							1321 011/17		,780"
36-48	12-24				יים אין	.769r			
48-40 .713 .757" .780" .780" .72-84 .767" .756" .780" .780" .764" .757" .775				<u> </u>	775				
171" .766" .780" 78									·780°
12-94 1367" 1360" 1760			<u> </u>						
1764" 1757" 1775					1331_	، 766"	<u> </u>		.7867
SUMMARY REMARKS Examiner Level II Date 4/29/03 Analyst Reviewer Page Ni Level Date Of Date Of Date Of Date Date Date Of Date D			<u> </u>						
SUMMARY REMARKS Analyst Level I Date 1/29/03 Reviewer N1 Level Date 1/29/03 Reviewer N1 Level Date 06 Of Date Of									<u> </u>
Examiner Level II Date 1/29/03 P-Scan Limited Analyst Level VS Date 5/13/03 Reviewer N1 Level Date of of	96-105.3				<u> โงารชา</u>	.739"			.170"
Examiner Level II Date 1/29/03 P-Scan Limited Analyst Level VS Date 5/13/03 Reviewer N1 Level Date of of	<u>.</u>		_		<u> </u>				
Examiner Level II Date 1/29/03 P-Scan Limited Analyst Level VS Date 5/13/03 Reviewer N1 Level Date of of					ļ				
Examiner Level II Date 4/29/03 P-Scan Limited Analyst Level So Date 5/13/03 Reviewer N1 Level So Date 5/13/03 Level Date of		_							
Examiner Level II Date 4/29/03 P-Scan Limited Analyst Level So Date 5/13/03 Reviewer N1 Level So Date 5/13/03 Level Date of		<u> </u>	<u> </u>		ļ <u>.</u>				
Examiner Level II Date 4/29/03 P-Scan Limited Analyst Level So Date 5/13/03 Reviewer N1 Level So Date 5/13/03 Level Date of	<u> </u>						· ·		
Examiner Analyst Level II Date 4/29/03 P-Scar Limited Analyst Analyst Analyst Analyst Level Ni Level No Le	SUMMARY			_					
Examiner Analyst Level T Date 4/29/03 P-Scar Limited Analyst Analyst Analyst Analyst Analyst Level 30 Analyst Analyst Level 30 Reviewer N1 Level 30 Level 30 Level 30 Level 30 Analyst Level 30 Analyst Level 30 Analyst Analyst Level 30 Analyst Level 30 Analyst Analyst Analyst Analyst Level 30 Analyst Analyst	0514516		<u>.l</u>		<u> </u>	J	L		
Level II Date 4/29/03 Level Date Of	KEMARKS				3.5	in the second	* 3 <u> </u>		<u> </u>
Level I Date 4/29/03 Level Date Of									
Level I Date 4/29/03 Level Date Of		<u> </u>							·
Level II Date 4/29/03 Level Date Of				······					
P-Scan Limited Level vs Date 5/13/03 Level Date of	Examiner		Analyst	Octor.	700	Reviewer			Page
		103	Level y	5 Date 5/	13/03	Level			of
CAN DOCK WINGLES THE LEGISLATION TO BE STORY		ACHED L	ロスダイ	z from	· -I. B.	ELDEN			<u> </u>

4/00	····									········		
3/00				111	TRAC	ONIC	P-SCAN				-	
	•			וט			PORT				-	
					DATA	י ולבו	FURI				_	¬ н
1	17/01			00.00					1.44			2156-# 31
	ATION	_\\`_~ ~		SYST	De	P- 4	! .	EXAM	ASTARI	6805 19		JOB#
CON	O SAST TO	HAK FAR	m_l		1, 5		<u> </u>	1 2/12	<u>IO⊃</u> MNATIO	N SURFACE	13	O3-41 ONDITION
"	W CHILIT		03	- A	IP		•	1 6	⊉ oo ii	TID TO PAINTS	ם ו	CANDITION
CON	FIGURATION		03	TO	**			CALI	BRATEC	RANGE		TEMP
		PLA	3.7		_				Ö	RANGE 70 2.12	."	1 17
CIRC	UMFERENCE/	TOTAL LENG	TH EXA	MINED)			REF.	LEVEL	CORRECTION (TR	ANS. COR	R) _
						5.4						
	CEDURE	A 40.4				- 1	REV		RALT		٠	14
FILE	COGEM!	M-24H)	>-	<u> </u>	007.5				SDUCE	CS OTHER		16. 750"
1		VE	-27	w	AU/	PL	STEL	1) DUAL	NSGL □ 0	DEG 177	ANGLE 45°
X ₀ R	EF, POINT (Lo)		1	Yo R	EF. POINT	(Wo)	RISEV-	SCA	TOW P			
1"	relow Ho	on so	d _		<u>_ 4°</u> t	24	RISEV-			15	71	
	SIZING ME	ETHOD		٨N	IGLE	R	EFERENCE C	AL. SHE	ET [•	SET-L	JP
111	45/60 DEGR	REE SHEAF	₹							····		
2	AATT		-									
3	RATT											· · · · · · · · · · · · · · · · · · ·
4	DUAL 0 DEC	ODEC			·			···				
14-	DUAL U DEC	SKEE	Щ.,			1010	TIONING	DIAAT	1011			
100	LASTION	11000	1 555				ATION INFO				1	
IND	METHOD	SIDE	DEP R. L		MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE
	_			- 1								
			[•		
								,	<u> </u>			
<u> </u>	 								·			
\vdash	 						 		 		 	
-	 	<u> </u>	 				 		-		 	
}	}					_		<u> </u>	 		}	
}	<u> </u>	 	 		<u></u>		 		ļ		 	
-		ļ	 -		ļ		 		 		ļ	<u> </u>
<u> </u>	<u> </u>		ļ						1		Ļ	
							1		<u></u>		<u> </u>	
				7				l	<u>. </u>		L	
								•	"		1	
							1 .		Τ-		1	
		 					1		 		t	1
RF	MARKS		<u> </u>		<u> </u>				-		1	
		3C1/ 3 5	-,,,,	c 4-	- 10-	^	75005					
1-	<u> </u>		-154		~	<u> </u>	<u> </u>	<u>,</u>				-
										- ·		
1-					·					· · · · · ·		
}=					1			TE	d .			Dogo
	mine	1	ł	Ana	alyst	7 -1	\sim	-	view	er		Page
	21-71M	off	,	4	Lel	4	Melan		<u>برر</u>			
Lev	el <u>IL</u> Da	ie <u>기 기</u> 도	03	Lev	/el· 🗫	Date	2/4/03	Le	vel	Date		of
1		•	1					1				

(N) SEE ATTACHED LIETTER FROM J.B. LEWER.

4/00						· · · · · · · · · · · · · · · · · · ·			
470,0	AUT	OMA	TED II	ILTRASO	VIC THIC	KNESS			
		• ,		TA REPO		TAIRLOO		0	Ser # 31
LOCATION		T	SYSTEM			FXAN	START	EXAM END	JOB#
200 EAST	TANK FART	n l	0.0.2	PSP-4		24	0750	0041	03-41
COMPONENT ID	107	۸ (<u> </u>			EXAV	INATION SURF	ACE	NOM. THICKNESS
CONFIGURATION	103-	H 1-	10	·			00 00		<u> </u>
CONFIGURATION	PLAT	E.	10			CALIE	RATED RANGE		TEMP Amb of
CIRCUMFERENC			MINED		·	REF.	EVEL CORRE	CTION (TRANS. CO	וספו
	· · · · · · · · · · · · · · · · · · ·			Z0,				· · · · · · · · · · · · · · · · · · ·	
PROCEDURE	mA-574T	·_ •	16 . ~	R	EV I	1	RIAL TYPE	THED.	CONDITION
FILE NAME/ITEM			55 - C	07.3	*		S <u>SA</u> CS C SDUCER	THER	
	VFSC	۲۲.	WAU	- / PLA'	re 5			GL 🖾 ODEG 🛚	ANGLE
Xo REF. POINT (I	ره.		Yo REF.	POINT (Wa)			WIDTH		
1"below H	IX START	XS	TOP.	Y START	SCC YSTOP	1 AVE.	1 1 0ki #102	15"	L MAY TOV
INDICATION	ASIANI	^ °	105	I SINKI	13105	THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0-12				·		875	. 871"	, , , , , , , , , , , , , , , , , , ,	. 662 "
12-20.8				·		.877"			662,
72 20,0				- -	 	10.7	1007		1.665
				- 	<u> </u>	 	 		-
	 			 		<u> </u>			-
				-	<u> </u>	<u> </u>	ļ		
	<u> </u>			<u> </u>	ļ				
		ļ					,		
								ļ ·	
	<u> </u>			1					
					<u> </u>	1			
-				1		`` -			
				1		<u> </u>			
				 	 	- -		<u></u>	
						 	<u> </u>		
	-			+		1	 		
CHANADY	<u> </u>				}				
SUMMARY				1	ļ				
DEM BIZA	<u> </u>	Ĺ			<u> </u>			<u> </u>	
REMARKS							·		
			<u>.</u>						•
Examiner	A .		[7	Analyst	. 11	, 🔠	Reviewer	<u> </u>	Page
mnon	<u>ज</u> ्म			Weels	4 th	ele-	<u>(۱۷)</u>		<u> </u>
Level	sale 15400	3_	[1	Level vo	bate_3	<u> 14/03</u>	Level	Date	(of
PSCON	Limited.								

W SEE ATTACHED LETTER FROM J. B. ELDER

4/00		IIC P-SCAN REPORT				Riser#31
LOCATION 200 FAST TONK FARM	SYSTEM PSP	- U	EXAM ST	ART S 0600	EXAMEND	
COMPONENT ID	-AP		EXAMINA	TION SURFAC	E	CONDITION
CONFIGURATION	то		CALIBRAT	D D D D TED RANGE		TEMP
CIRCUMFERENCE/TOTAL LENGTH EX	AMINED		REF. LEV	O' TO EL CORRECTI	ON (TRANS.)	CORR) AMB OF
PROCEDURE		7.8" REV	MATERIA			DB
COGEMA-SVUT-	CNS-007.3		□ ss	CS OTH	ER	TAK 275"
FILE NAME/ITEM# Vになて、L	DALL / PL	ate 5	TRANSOL	JCER AL 🄼 SGL	ODEG	BANGLE 450
1 below NORZ weld.	Yo REF, POINT (W	o) 11 Pice-	SCAN WI	DTH	15"	
SIZING METHOD	ANGLE	REFERENCE CA	L. SHEET			T-UP
1 45/60 DEGREE SHEAR						
2 AATT 3 RATT				7		
4 DUAL 0 DEGREE			-	-		
		CATION INFO				
	PTH MAX X LIG. AMP	1 LENGTH	X2 Y	1 W!I	DTH Y2	INDICATION TYPE
			-			
	\longrightarrow	\rightarrow				
						
			, 	` 	\rightarrow	
DEMARKS						
REMARKS NO CRACK LEI Examiner	Analyst		Revie	ewer -		Page
Level II Date 44/03 P-Scan Limited NI SEE ATTACH	<u> </u>	ate <u>3/4/05</u>	Level			of

4/00	 	1_4/4							
1 4700	AUT	OMATED L	ILTRASO	NIC THIC	KNESS			•	
		D.A	TA REPO	TRT				Rise	r # 31
LOCATION	مح داده	SYSTEM	PSP-	1	EXAM,S	START	EXAM	END JO	3#
200EAST T				J	1/2-7/9	NATION SURF	0 221		NOM. THICKNESS
COM CITEM IS		103-AF)		1 120	ob □ip [PAINTED		500"
CONFIGURATION	PLAT	s 70 F	STAJ		CALIBR	ATED RANGS			TEMP
CIRCUMFERENC					RSF. LE	3" TO VEL CORREC	TION ITRA	NS CORRI	Amb of
			& ૩ૅ						4 03
PROCEDURE COGEMA -	SUIT- T	100-21	a '	REV I		IAL TYPE	THED	•	CONDITION
FILE NAME/ITEM	#		•		TRANS	DUCER			
V ner nome i	<u>VERT.</u>	<u>ښمرب</u> /	240 /	71 CLOI	X	DUAL DISC		G AN	GLE
X REF. POINT (plem seld	15t P	ASS TO CL	200 /	SCANV	1 HIUIF	5"	•	•
PART#1	X START	X STOP	YSTART		AVE.	MIN. THK,	AREA		AX. THK.
INDICATION 0-12	<u> </u>			+	THK.	R, LIG.	REPORTA	SLE .	ده سر کے
12-24					1504"		<u>-</u> .		1515°
				 	15087				·515"
24-36					1510"	.563"			, 52a"
36-48					_510"	4990			515"
48-60		<u> </u>			7510"	,505			, 515"
72 - 83.1					1507"				· 5157
12-03,1		 			5ء5"	1499"			.515"
<u> </u>		<u></u>	- 	 					
				1			 -		
								-	
			 	 					
				†					
				 					
			<u> </u>	·					
SUMMARY			 	i	ļ. 			· 	
			<u>.</u>					·	
REMARKS						· 			
F		····	A = = 1: 1		7 - 2				10
Examiner	46.	1	Analyst	2 # XI	, [Reviewer			Page
Level II D		<u> </u>	Level TAR	Date 2/	9/08	.evel	Date		of
P-Scan L			<u></u>		7/ L		De(C		
(v) See P		Lette	r Fra	m I.B.	Flder				
	,			1 5.	\sim				

4/00			υ			P-SCAN			· · · · · · · · · · · · · · · · · · ·	2			
					A REF	OKI				K	ISER31		
LOCA 20	D FERST T	RONE FO	ern sys	TEM PS	5P-4		EXAN 1/2	STAR	EXAM 3 0750 22	IEND J	03-41		
COM	PONENT ID						EXAM	IINATI	ON SURFACE	CON	NOITION		
CONF	IGURATION		3 - 120 ATE	\ <u></u>			CALI	RATE	DRANGE		TEMP AmB of		
CIRCI	UMFERENCE/) <u>c</u>	3 "		REF.	LEVEL	CORRECTION (TR	ANS, CORR			
	EDURE		-		F	REV		RIAL		7711			
FILE	VAME/ITEM#					D 1 N=r 1	TRAN	SDUC	CS OTHER	TAI	1		
X ₀ RS	F. POINT (Lo)	VEK	7. كې او۲	REF. POINT	(Wa)17	PLATE !	SCAN	DUAL WIDT	- d⊠SGL □00 H		VGLE_ 42		
ı"be	SIZING ME	<i>Weld</i> THOD	IST.	Pass To NGLE	Q of	FERENCE C	AL SHE	FT		SET-UF	<u> </u>		
	45/60 DEGR									. 02.0.			
	2 AATT 3 RATT												
<u> </u>	DUAL 0 DEGREE												
						TION INFO							
מאו	METHOD	SIDE SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE		
					· · · · · · · · · · · · · · · · · · ·					ļ	<u> </u>		
			,=,- <u></u>										
											 		
			<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>							ļ	 		
		-						 					
			<u> </u>					-		 			
DE	MARKS									I			
		LACK	LIKE	TN	Dra	<u> </u>	15						
							·			. –			
													
	miner	الم ا	An	alyst	4.	n_{i}	Re	viev	/er		Page		
Leve	el 📶 Dal		13 Le	el MS	Date	2 12 03	Ĺē	vei_	Date		of		
_	au Limit		<u></u>				<u>~</u>	~	F				
NI	7 556	- 4111	CHED	1-1-7	NEX	7 4502	J1.	15	، در ۱۹۰۸				

	4/00	AUI			ONIC THI	KNESS			• .
				DATA RE	PORT				<u> 215er #31</u>
	LOCATION TA	ank FARM	. SYST	PSP.	.4		START 0730	EXAMENI 1605	JOB# 03-41
	COMPONENT ID		102	-AP		EXAM	INATION SURFA	CE	NOM. THICKN
	CONFIGURATION		. 10			CALE	SATED BANGE		TEMP
	CIRCUMFERENC	E/TOTAL LENGT			- · ·	RSF.	3" TO	I.O IION (TRANS.	CORR) Amb
	PROCEDURE		3011.	/ 5	7,2 * I REV	i	RIAL TYPE		CONDITION
	COGEMA-	2 .	1	1.3		□ s:	S MICS OT	HER	
	VEQT W	BULL 2ND	PLAT!	52 d	PLATE 2	Δ \perp κ	SOUCER (DUAL [] SGI WIDTH	. 💥 odeg	☐ ANGLE
	X REF. POINT (o Horz	Yo RS	F. POINT (Wa	17" CL 18	SCAN	HIDIH	15"	
	PART#/ INDICATION	X START	X STOP	Y STA	T YSTOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX, THK.
-	0-12		 		-	490"		REPORTABLE	1505"
- [12-24					14921			50.5"
	24-30,1	·				,492	1481"		, 50 S"
Bo	0 10					1,400		·	~
-	0-12	<u> </u>	 			1492		 	15054
Ì	24-36					494			1505*
[36-48					1,492"	14750		, So5"
ŀ	48-57.2		ļ	<u> </u>		1490"	.471*		505
ł		-,				 	1		
İ									
}			<u> </u>			<u> </u>		 -	
	SUMMARY		1						
							• •		
	REMARKS	·							
-			* **.				*: : * * * *		
	2A 57	P ONTSA	ك 3۵	of 2		•			
	~								
	Examiner	ر مارا		Analyst	2517	7.	Reviewer		Page
}	Level I	ate //30/03	<u>.</u>	Levety	0 ate 2	9/03		Date	of _
- 1	P-Scau L			1	_	7			

Att. 2-15

4/00			U	LTRAS(DATA		P-SCAN PORT			 		- 1	ISER 31
	TION	> . NA = . A	SYS	TEM De	P-L		EXAIV	STAR	, , , , , , , ,	EXAM E	ND_J	03-41
COM	ONENT ID	BOY FOR			7	<u> </u>	EXAM	INATIC	0743 ON SURFACE	10	100	NDILION OS-41
	io (b) tro	10	3 - 190 10	P			. i 5⊼	OD	FID FIDE	NTED		
CUNF	IGURATION	PLA				,	CALIE	RATE	RANGE	2.0	OM	TEMP OF
l		OTAL LENGTH		30'	٠ ا	52.1"	i		ンパーし CORRECTION	(TRAN	S. CORR)
	EDURE	· 5VUT-				REV	MATE	RIAL T	YPE CS OTHER		TUL	s. 1500"
FILE	IAME/ITEM#	· - · · · · · · · · · · · · · · · · · ·						SDUCE	R			
X _C RE	F. POINT (La)	r wau	- 12 N	PLATEF. POINT	TE (Wp)/	2 g 2 A	SCAN	DUAL WIDTI	o5≰SGL (NGLE_45°
ı'be	ow Hole 1	<u> </u>	1.42	3 10 74	O- 2	- LV27		== 1		15		
4	SIZING ME 15/60 DEGR		Al	VGLE	R	EFERENCE C	AL, SHE	<u> </u>		<u> </u>	SET-UF	<u>, </u>
	AATT	CC SHEAK	 		+							
	RATT		 		-			$= \downarrow$	·			
	DUAL O DEC	SREE	 		+							
			<u> </u>	ΙŃ	DICA	TION INFO	RMATI	<u>on</u>				
IND	METHOD		DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDT	H	Y2	INDICATION TYPE
							ļ 			_		
						<u> </u>						
						<u> </u>		 				-
					\rightarrow		<u> </u>		_			
										}-		
						 		_		-		
												-
										egthanking		
					,							
											. '**	
	Marks O Ca	ACK L	z ICC	3100	<u>ی ک</u> ر	ATSON	<u>چ</u>					
رھ	3 57¢	187150	Q,	30, 9) F	2						
Exa	nines Drud		An	alyst	ν C	n., `		view	er		T	Page
Leve	Dal	e 1/30/0				5/18/03		112 vel_	Date_			of
N)	cau Lim		HED ——	721	W.F.X	2 FRON	سان	B.	ELDE	Ω		

Att. 2-16

	4/00											
	4100	TÜA	OMATED U DA	LTRASOI TA REPO		(NE	ESS			P.	iser¥3	,
	LOCATION		SYSTEM		J		ĘXAM S	TART	EXAM	END	JOB#	·
	COMPONENT ID		רע	<u> PSP- </u>	1	_	1290	3 0750 IATION SURF	227	ری ا	NOM, THICKN	FOC
		103-	AP					OD DID [NOM, THICKN	
	CONFIGURATION	PLAT	₹.				CALIBR	ATED RANGE			TEMP	0,F
,	CIRCUMFERENC	E/TOTAL LENGT	H CYANUNEO	4,5" 8	44,2"		REF. LE	VEL CORREC	TION (TRA	NS. COF	RR)	B
	PROCEDURE			R	EV .	7		IAL TYPE			CONDITIO	
	FILE NAME/ITEM	<u>mA-5√4T</u> #			<u>.</u>		TRANS	DECEMBER OF	THER			
		VERT, U	DALL / 2 NE	PUME	34 3A		6 2] [JUAL SG	L 🗷 ODE	G 🗀	ANGLE	
٠.	Xo REF. POINT (I	0) 082 well.	Yo REF. F	POINT (Wo) 1-	THE GOT IS	T S	SCAN V	VIOTH	15"	(
	PART#/ INDICATION	X START	X STOP	YSTART	Y STOP	AV TH		Min. THK, R. LIG.	AREA REPORTA		MAX. THK.	
(3)	0-12					_	<u>د</u> ه"	.554"	KLFOKIF	ULL	,5901	
	12.24						ยร^	.550			5957	
	24-36	1			1		565''	.572"			595"	
	36-44.5						5 86"	, 579"			595	
-												
(3 A)	0-12					, 5	:E5"	·57£*			,595"	
_	12-24					Ç	8Z"	570			.590*	
·	24-36					. 5	. وم	.576*			590	
	36-44.2					ç	79"	,545			590*	
				<u> </u>	1						<u> </u>	
				<u> </u>								
	·					Ŀ						
:	.,				ļ							
			<u> </u>	<u> </u>	<u> </u>						<u> </u>	
					<u> </u>							
	SUMMARY									•		
,	REMARKS		<u></u>	1	.1	-		l	<u> </u>		<u>. </u>	
		WIKD @	401" -	νε 3	100			· 			1 10	
1	-212-214	1111111	<u> </u>	() <u>~</u>								
	Examiner	1.1.		Analyst	ent Re			Reviewer			Page	
		Date 124/0	<u> </u>	evel WA	Date 3/4	沅		Level	Date		of	-
	P-Scau Li		<u> </u>		4.0 <u>3/</u>	45/	'				-	
(/2		O	<u> </u>	<u>-</u> -					
. , \	NI) SEE	1.4 c) see-1-9	בט בפי	nerh	kom .	٠ ب	₩,	一トカモロ	ζ			

4/00			L			P-SCAN		<u></u>							•
				DATA	REF	PORT							Rzsi	<u>i</u> r 3 1	
LOCATIO	AT TEA	nic far	SYS	TEM - '	7			EXAM 3/11	STAR	ा <i>0</i> 926	EXAN	IEND	JOE	# { -03	
COMPON	IENT ID	10	3 - A	P				EXAM EX	INATI	ON SURFA	CE		COND	TION	
CONFIGU	JRATION	72	17F. TO					CALIB	RATE	DRANGE				TEMP	٥F
CIRCUM	FERENCE/T	OTAL LENGTH	EXAMINE	90	12"			REF. I	EVEL	CORRECT	TION (TR	ANS. C	ORR)	<u> </u>	DB
PROCED		-SVUT-	7 m)5 -		F	REV		MATE	RIAL	TYPE CS OT	HED	-	ΔK.	,562	
FILE NAM	ME/ITEM#	VERT					\exists	TOAN	CDUIC	CO.				LE 45°	
Xo REF. I	POINT (Lo)	z weld	·Yo	REF. POINT	(M°)1.	PASS	•	SCAN	WIDT	. жу ос. Н	157	JEG (<u>⊘i</u> ANG	LE 79	
S	IZING ME	THOD		NGLE	RE	FERENCE C	AL.	. SHE	ET :		, ,	SE	T-UP		
		EE SHEAR													
2 AA 3 RA			 		+				-						
4 DU.	AL 0 DEC	REE			10104	71011 11150									
IND M	ETHOD	WELD	DEPTH	MAX M	X1	TION INFO)KI TX		ON Y1	ΤW	DTH	Y2		INDICAT	ION
		SIDE	R, LIG.	AMP	· . · . · · . ·		<u> </u>		,		· · · · · · · ·			TYPE	
							\vdash								
							╁╴					 			
			·				┝	_				-		•	
	·						╀			\rightarrow					
													\leq		
*					-		┝			· .	-				
REMA							<u>+</u>			1	····				
1NO	CKAG	K TZK	<u> </u>	DZ COT	<u>iso</u> r	<u> </u>			 ,						
				······································						<u>-</u>					
Exami	ner		Ar	alyst				Re	view	/er			ĮΡ	age	
Level	4	te3/11/03	_ 4	ver		Ruse	_	3	<u>D</u>	-			_		
FEAGI."	ARZ Dal	10.7 Mil 17.3	- Le	ver 3 22	Date.	5 16 03	,	Le	vei _	Dat	.e		-	of	

NO SEE ATTACARO LITTER FROM I. B. ELDER

	4/00	AUT	OMATED UI	TRACO	NIC TUICE	NECC				
		AU,		TA REPO		.14699	•		ρ.,	ser# 31
	LOCATION	TANK 50.00	SYSTEM	5P-Y			ISTART	EXAM	END	# BOI
	COMPONENT IC	TONK FAR		2 1-1-		EXAN	082	ACE		NOM. THICKNESS
	CONFIGURATIO		3-AP		·	CALIS	OD ID	PAINTED		1 150°
		PLAT	re			CAEI	LEVEL CORRECT	. a ''		Ama of
		CE/TOTAL LENGTH	1 EXAMINEO (30) 5 なっち 。			REF.	LEVEL CORRE	CTION (TRA	NS. CORR	
	PROCEDURE	-SVUT-X	35.00m.1		EV 1		RIAL TYPE			CONDITION
	FILE NAME/ITEM	() ()	4				SOUCER			- . l
	X ₂ ,REF,POINT (RT WALL	/2 NO/PLA	TE 4	404 121	K SCAN	DUAL SO		.G □ ∧	NGLE
•	"below	HORZ Weld	PASST	o drot	2 md PASS			15"	<u></u>	
	PART#1 INDICATION	X START	X STOP	YSTART	Y STO?	AVE. THK.	MIN. THK. R. LIG	AREA REPORTA		MAX. THK.
PLATEN	0-12			:		JU5"	750"			ุการ"
	12-24					<u> ግን</u> ቦ	17574	<u> </u>		,750"
	24-30.6				<u> </u>	<u>. ጉጉ ጌ"</u>	າຜາ*	<u> </u>		·760~
•				<u> </u>	<u> </u>					
PARKUR	0-12			ļ	 	<u>,7724</u>	<u>, ገራን"</u>			.120"
4g.	12-15,6				 	<u>יורר.</u>	765"			· <u>ገፅ</u> ሬ^
				 	-	.770"	יאטר.	<u> </u>		.780"
PATENTS	12-24	i		<u> </u>	i	.776^	1	 		·780"
₹	24-36					765"				, זים "
ļ	36-48					.761"	1753			770"
Ì	48-58.8]				<u>.755"</u>	.737"			-2077،
							<u> </u>			
		· · · · · · · · · · · · · · · · · · ·		<u> </u>			 			
.	SUMMARY			<u> </u>	1		1			
	OUMMAN								.	
	REMARKS		·	<u> </u>			<u> </u>	L		
	TA STOR	IRD 60 3	وه "۲,۰	4 .	L/8 5-	N7514	Q 15	5 01.	Au	
			· · · · · · · · · · · · · · · · · · ·							
}	Examine		A	nalyst		1	Reviewer			Page
	MOH	udd_		well	£2720	ا ہے	(a)			_
		Date_3/5/03	L Le	evel VXZ	Date_4//	5/03	Level	Date		of
ļ	P.Scan		1-11-1	F	<u>,,, e, ,,</u>					

Att. 2-19

4/00			U		ONIC A REI	P-SCAN PORT					BZ	SER31
	NOITI O PEAST 1	D . 110 TTA	SYS	TEM 'D	5P-1	· · · · · · · · · · · · · · · · · · ·	EXAM	START	835 E	CON MAX	JOE	
СОМ	PONENT ID				27	1	EXAM	INATION S	URFACE		COND	D3-41
CON	IGURATION	10	3-A	P			1 671 15	********	ID PAI		<u> </u>	TEMP
L		PLAT	ら			.1	CALIE	C'	RRECTION	2./2	• [AmB .
CIRC	UMFERENCE/	FOTAL LENGTI 3 & E	H EXAMINEI	5.5"	. 5	ሪ ,ሄ "	REF.	LEVEL CO	RRECTION	(TRANS.	CORR)	BQ &
	CEDURE					REV		RIAL TYPE			-	
FIFI	O C C MANE/ITEM#								OTHER		THIC	· · · · · · · · · · · · · · · · · · ·
YA RE	F. POINT (Lo)	שבנר / ז	Val	LA TL	T/W-\/	14 4 B		DUAL &	XSGL [[3] ANO	SLE 45"
1"6	elow Hol	<u>2⊋ سواط</u>	PAS	708	<u> </u>	and PASS				15"		·
	SIZING ME		Al	NGLE	R	EFERENCE C	AL. SHE	ET		SE	T-UP	
) - 	45/60 DEGR	EE SHEAR	+									
	RATI		- 								 	
	DUAL O DEC	GREE	╁┈━╌		1		<u></u>	-+-				· · · · · · · · · · · · · · · · · · ·
				11	VDIC/	TION INFO	RMATI	ON				
IND	METHOD	WELD SIDE	DEPTH R. LIG,	MAX AMP	X1	LENGTH	X2	Y1	WIDTI	1 Y2		INDICATION TYPE
				ļ	<u> </u>	<u> </u>	<u> </u>					
		L		<u> </u>		<u> </u>	ļ					·-··
					 							
					 -				1			
						 	ļ —		1			
				ļ								
		<u> </u>			ļ <u>.</u>	<u> </u>			ļ			
						 			\	_+		
		 	· · · · · · · · · · · · · · · · · · ·		l 	 	-		-			
	7.5					<u> </u>	1 7 7 7 7		1		\rightarrow	$\overline{}$
		1					<u> </u>			_		
40	Marks Star O Cre	******				48 STAR		ا 5.5	of 41	3		
		,										
<u> </u>	mine D	rdy ,	_\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	alyst Leele	<u>,4</u>)	Qu_		viewer	·- <u>-</u> -		_	age
	Da Scan Li		23 Le	vel 303 4	Date	5/20/07	S Te	vel	Date		-	of
NI) SEE	ATTA 3	CHEC	115	TEX	e feor	·I.	B,E	اللحر	}		

Att. 2-20

4/00	AllT	OMATED UI	TRASON	VIC THICI	(NESS		<u> </u>	
		DA.	TA REPO					iser & 31
LOCATION 200 EPST	TANK FARI	SYSTEM	<u> P5P-4</u>	·	2410	3 6757	EXAMEND 1400	JOB# 03-41
COMPONENT ID	103-	AP				NATION SURF	PAINTED	NOM. THICKNESS
CONFIGURATION	PLAT	10 € .			CALIBR	ATED RANGE		TEMP Amb of
CIRCUMFERENC			20.		REF. L	EVEL CORREC	CTION (TRANS. CO	ORR) & DB
PROCEDURE	mA-SV4T	- ZN5 • 00	Ŕ	EV)		IAL TYPE	TUED	CONDITION
FILE NAME/ITEM	111			DIATE C		DUÇER	SL Ø ODEG [T ANGLE
XAREF. POINT (I	Lo)	YOREF. P	OINT (NO 17	PASS	SCAN		15"	JANOEL
PART#/ INDICATION	X START	X STOP	Y START	YSTOP	AVE.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0-12			· · ·		. 876"			.283.
12-20.7	ļ		ļ		1060"	. ଜନ୍ୟ:		.682.
				- 4	1877"			
 	 		<u> </u>	 	1817 80 5-03			
			<u> </u>					-
							<u> </u>	
				<u> </u>	· · · · · · · · · · · · · · · · · · ·			
			<u> </u>					
· · · · · · · · · · · · · · · · · · ·	<u> </u>		<u> </u>	ļ <u></u>	 			
					<u> </u>			
	 		 	1	 			
SUMMARY								
REMARKS	L <u></u>		L	<u></u>	l	L		
		· · · · · · · · · · · · · · · · · · ·			*		1. 1.	
							_	
Examinel	1.1.5		Analyst	2		Reviewer		Page
Level II [Date 7/1/03		evel 72	Date_ 3 /	4/03	Level	Date	of

WI SEE ATTACHED LETTER FROM J. B. ELDER

LOCATION PSP-4 PSP	4/00			Ĺ		ONIC A REF	P-SCAN PORT					1	Rzser	31	
COMPONENT ID OBJECT CONFIGURATION PLATE CIRCUMFERENCE/TOTAL LENGTH EXAMINED QO. 9 PROCEDURE CO. 5 TO 2.5" CIRCUMFERENCE/TOTAL LENGTH EXAMINED QO. 9 REF. LEVEL CORRECTION (TRANS. CORR) DB PROCEDURE CO. 5 TO 2.5" REF. LEVEL CORRECTION (TRANS. CORR) DB MATERIAL TYPE SIZING METHOD ANGLE REF. POINT (Lo.) 1 45/60 DEGREE SHEAR 2 DATT 3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION INDICATION TYPE REMARKS				SYS	TEM		1	EXA							
CONFIGURATION PLATE CIRCUMFERENCE/TOTAL LENGTH EXAMINED CIRCUMFERENCE/TOTAL LENGTH EXAMINED PROCEDURE COSEMA-SUNT-INS-07.3 FILE NAME/ITEM VERT. WOLLD PLATE 5 FILE NAME/ITEM VERT. WOLLD PLATE 5 SIZING METRIAL TYPE TRANSDUCER 200 COM	CONENT ID	mk far	w	P5P-	9				0800	<u> 14</u>					
CONFIGURATION TO CALIBRATED RANGE O" TO 2.5" TAMP OF TO CIRCUMFERENCE/TOTAL LENGTH EXAMINED 20.9" PROCEDURE COGEMA S VUT 3 SS - 007.3 REV MATERIAL TYPE SS ACS OTHER TAK. 875" FILE NAME/ITEM# FOR TOTAL LENGTH EXAMINED 20.9" PROCEDURE COGEMA S VUT 3 SS - 007.3 REV MATERIAL TYPE SS ACS OTHER TAK. 875" FILE NAME/ITEM# FOR TOTAL SS ACS OTHER TAK. 875" FILE NAME/ITEM# SCAN WIDTH SS SCAN WID	COM	-ONENT ID	10	3-A	₽ .								CONDITIO	JI V	
REMARKS REF. LEVEL CORRECTION (TRANS. CORR.) DB REF. LEVEL CORRECTION (TRANS. CORR.) DD REF. LEVEL CORRECTION (TRANS. CORR.) DD REF. LEVEL CORRECTION (TRANS. CORR.) TAKE. STO. TAKE. S	CONF	IGURATION							BRATED	RANGE					
PROCEDURE COGETIAL SUNT TIME 1 SET UP 1 SET UP 1 SET UP 1 SIDE R. LIG. AMP X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE INDICATION INFORMATION NFORMATION INDICATION INFORMATION INFORMATI	CIRCI	IMPERENCEA	OTAL LENGT	H EYAMME	<u>n</u>			DEE	I EVEL	COPPECT	2.5	ANS C	000/		٥F
FILE NAMERITEMS VENT. WOLLD PPLATES TRANSDUCER TRAN	CIINO	DIVIN ENCEPTION	O (AL LLNO)	II EXCUSUITE	20.	9 📶	_/	ł			ION (III	A110. (1	ONN)	<u> </u>	В
FILE NAME/ITEMS VERT. WOLL 20 PLATES TRANSCUER DUAL 50 SGL 00DEG NAMELE 45 SCAN WIDTH SZAN WIDTH SZINIG METHOD ANGLE REFERENCE CAL. SHEET SET-UP ANGLE INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION TYPE REMARKS	PROC	EDURE	~ > >	> 6	605	-, F	REV,						1 / C	\= "	
V	Ell E I	JAME/ITEM#						TRAN	S EXIT	CS OH					-
SIZING METHOD ANGLE REFERENCE CAL. SHEET SET-UP 1 45/60 DEGREE SHEAR 2 AATT 3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS			VERT.	Wall	2~°/	PLAT	ES				. 🗆 00	DEG 2	ANGLE	450	
SIZING METHOD ANGLE REFERENCE CAL. SHEET SET-UP 1 45/60 DEGREE SHEAR 2 AATT 3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD DEPTH RAY X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS	X₀ RE	F. POINT (Lo)		· Yo	REF. POIN	T (Wo) 1	7". QL 04- 1\$T	SCA	I WIDTH	1	14	- "			
1 45/60 DEGREE SHEAR 2 AATT 3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD DEPTH R. LIG. AMP X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS	i oe			1743	NOLE	C 0 + 2	EEDENCE C	AI CUE	ci I				T I ID		
2 AATT 3 RATT 4 DUAL 0 DEGRÉE INDICATION INFORMATION IND METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS	1				NGLE	1 1	J ENERVE C	nu. one	-51			<u> </u>	-UP		
3 RATT 4 DUAL 0 DEGRÉE INDICATION INFORMATION IND METHOD WELD SIDE R. LIG. AMP X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS			CC OILCAI			-									
A DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD SIDE R. LIG. AMP X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS				 		+									
IND METHOD WELD DEPTH R. LIG. AMP X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS			REE	-				····							
SIDE R. LIG. AMP TYPE REMARKS					ii	VDICA	TION INFO	RMAT	ION						
REMARKS	IND	D METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2												NO	
REMARKS												i –			
REMARKS															
REMARKS															
REMARKS															
REMARKS					-	<u> </u>		<u> </u>	<u> </u>			ļ		~	
REMARKS					 	>	· · · · ·		ļ			 			
REMARKS					-			<u></u>	ļ			┞			
REMARKS					 	 		_	<u> </u>			}	 }-		
REMARKS					<u> </u>	 	 		-			 			
REMARKS					┿		 			+		-		 -	
REMARKS		L	<u>-</u>		 	 	<u> </u>		 		<u> </u>	-	+		
REMARKS		<u> </u>			 	\vdash		 	 			 	+		
					 	+-	 	 	 	+		1	-+		···
	REN	MARKS	<u> </u>		4	<u> </u>		Ь	<u></u>	1		<u>. </u>			>
			ACK. I	SICU	X.Z	220	シレエン・つい	5							
										_					
_															
													- -		
Examiner Analyst Reviewer Page	Exa	miner)	1.	14	nalyst	2.11	n.		_	er			Pa	ge	
Level II Date 2/4/03 Level Sizio3 Level Date of		4) TUAR	120/11	- 14	MAC	Water of the same	C 2 1 2 2			Da	<u> </u>		-	C.F	
Level T Date 2/4/03 Level Date of of of of				ے ح	A CI TAZ	γ υαις	-ज्ञास्तर	"	-vei _	Da	·E		٠		

(N) SEE ATTACAGO LITTER FOOM I. B. ELDER

4/00	AUT	OMATED U	LTRASON	NIC THICK	NESS			•
		DA	TA REPO				6	ISer# 31
LOCATION 200 EAST	TONK FAC	SYSTEM	P5P-4		2/6/0	START 3 0754	EXAMEND 5 1330	JOB#
COMPONENT IO		3-AP			EXAMII	NATION SURF.	ACE	NOM. THICKNESS
CONFIGURATION	√	70			CALIBR	OD DE CONTRACTOR	J PAINTEU	.500" TEMP
CIRCUMFERENC	PLAT E/TOTAL LENGT		LATE.		REF. LE	O.3 72 EVEL CORREC	TION (TRANS. C	ORR) AMB OF
PROCEDURE			89. 6	> ~ EV		IAL TYPE		DB CONDITION
COCEMA-	-SVUT-	<u>o-eul</u>	<u>"" 5. F0</u>	i .	□ ss	⊊rcs o	THER	CONDITION
FILE NAME/ITEM	ひた の	T. WELD	/PLAT	5 2	TRANS	DUCER DUAL SO	L MODEG I	ANGLE
XOREF. POINT (L	HORZ W	ed. Yo REF. I	CL of Ve	rt Web	SCANI	WIDTH	11.2 4	•
PART # / INDICATION	X START	X STOP	Y START	Y STOP .	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
10-12			•		.495"	٠423*		1505"
12-24					1495"	14741		1505"
24-36		ļ			.496"			. 805"
36-48			ļ <u></u>		.496"	.490"		1505
48-60		<u> </u>	ļ		<u> 1496"</u>	'AJ3		. 202,
60-72					.496"	482"		1505
72-84			·		.495°	-484"		√S025"
84-89.6			ļ		14901	.483		1505"
J		ļ	ļ					
			ļ					
		<u> </u>	<u> </u>				····	.
ļ				ļ				
<u> </u>								
		 						_
SUMMARY			ļ			· ·		
·							·	
REMARKS	<u> </u>		<u> </u>		·			
WOLLIS		IDE OF	UERT.	MELD	<u>(~)</u>			
<u> </u>		·			·			
		 -	<u> </u>		•		*	
Examiner) 1.1	1	nalyst	m	1/	Reviewer		Page
Level # D		_ 4	Wola	Dalas		<u>vi)</u>	Dela	of
P.Scan I	late after	으 1	evel 🚾	Date_3//	1107	Level	Date	— — ·· —
	winted.							

4/00			· · · · · · · · · · · · · · · · · · ·		·········		····	·						
	AUT	OMATED L	JLTRASON	IIC THICK	KNESS									
		D/	ATA REPO	RT				1215	er #31					
LOCATION		SYSTEM	7		EXAM,S	TART	EXAMEN	4D 10	8#					
200 EAST	TANKFAR	<u>w</u>	PSP-	<u> </u>	2/6/0	3 075	<u>5 /334</u>	ملہ	3-41					
COMPONENT ID	10	3-AP				NATION SURF			NOM THICKNESS					
CONFIGURATION		70			CALIBR	ATED RANGE			I TEMP					
	121-1-21	ت ا	PLATE		l ,	3"70	1.0"		PMB OF					
CIRCUMFERENC	E/TOTAL LENGTH	H EXAMINED	89,0	, 11	REF. LE	VEL CORREC	TION (TRANS	s. Corr)	08					
COCENTA-	CUUT_7	-015 -00		EV.		IAL TYPE	TUEO		CONDITION					
FILE NAME/ITEM				_\		DUCER	Trick							
	A に バリ		2 PLAT	<u> </u>	<u> </u>	DUAL S	L ZODEG	☐ AN	GLE					
Xo REF. POINT (L	o Hoez we	Yo REF.	POINT (W)	t weld.	SCAN V	HTOIN	11.25	•	*					
PART#/	PART # / X START X STOP Y START Y STOP AVE. MEN. THK, AREA MAX. THK. INDICATION THK. R. LIG. REPORTABLE													
0-12 .525' .510" .535"														
12-24 .528" .520" .535"														
12-24 .528" .520" .535" 24-36 .525" .519" .535"														
			 		.521"	.519"			,530"					
36-48				 	,520"				,530"					
48-60				 	1	.51z"								
60-72				<u> </u>	.519"	1514"			1530"					
72-84				ļ <u> </u>	1513"	,501"			.530°					
84-89.6				<u> </u>	,510"	502"			.520"					
				ļ										
<u> </u>						<u> </u>								
					l									
				<u> </u>		1	<u> </u>							
 			 	1	1	 								
SUMMARY														
REMARKS	<u> </u>	<u> </u>		ــــــ	1		1	l	<u> </u>					
504D3	CTNE	- 05 3/5	SET WE	(t	7				1 1 2 1 2 1 1 1 1 1					
2002	500	J OF VC	<u> </u>	<u>, -,</u>		 	·····							
Examiner		· ··· · · · 	Apalyst		· I	Reviewer			Page					
H W W	hadel	ļ	Woll	4)2	.	(M)								
Level IL	Date 2/6/10	3	Level VX			Level	Date		of					
P-Scan L			- 4	. - = .			· —		<u> </u>					

@ See Attached Letter From J. B. Elder

4/00	DAT	SONIC P-SCAN A REPORT	1.		Rzs	er 31					
LOCATION 200 EAST TANK FACE	SYSTEM PSP-	4	EXAM ST	TART EXA		8#					
COMPONENT ID		EXAMIN	2/6/63 08/5 1340 41.03 EXAMINATION SURFACE CONDITION								
CONFIGURATION	70 TO	CALIBRA	Ø OD ☐ ID ☐ PAINTED CALIBRATED RANGE TEMP								
CIRCUMFERENCE/TOTAL LENGTH	EXAMINED P	PCF LEV	O" To 2.0 AMB								
<u> </u>	E/V WINITED		DB								
PROCEDURE COGEMA-SVUT-ZNS-007.3 REV MATERIAL TYPE USS CS OTHER TAK., 500"											
FILE NAME/ITEM# VERT. W	1	2376	TRANSD	TRANSDUCER ☐ DUAL SS SGL ☐ ODEG SS ANGLE 60°							
XOREF. POINT (LG) I below Hoez Weld	Yo REF. POIN	T (Wo) . 1	SCAN W	INTH		are 60					
SIZING METHOD	ANGLE	<u> </u>	CAL. SHEET	10	SET-UP						
1 45/60 DEGREE SHEAR	ANGLE	_ NEPERENCE	CAL. SMEET		SE1-UP						
2 AATT					<u></u>	•					
3 RATT											
4 DUAL 0 DEGREE	11	DICATION IN	FORMATIO	<u></u>							
	DEPTH MAX R. LIG. AMP	X1 LENGTI		71 WIDTH	Y2	INDICATION TYPE					
						<u> </u>					
					<u> </u>						
		 				· ·					
			\rightarrow	$\overline{}$	 						
] 	· · · · · · · · · · · · · · · · · · ·					
						2 2 22 2 2 2					
REMARKS	l				1						
NO COACK LS	KR ZN	DSCATE)N>								
Examiner	Analyst	- 1000	Revi		F	Page					
Level II Date 2/1/03 P-Scan Limited	Level T	Bate 5/19/		I Date		of					
N) SEE AMACAE	O LETE	r from	J. B.	ELDER	•	,					

- Committee of the comm

4/00		RASON DATA F		P-SCAN ORT						RISER 31			
LOCATION 200 EDST TROVE FOR	PSF	EXAM			EXAM		JO3# O3-41						
COLDONICUE ID	EXAM	EXAMINATION SURFACE CONDITION											
CONFIGURATION PL	CALIE	Ø OD ☐ ID ☐ PAINTED TEMP											
CIRCUMFERENCE/TOTAL LENGTH	REF. LEVEL CORRECTION (TRANS. CORR)												
PROCEDURE		MATERIAL TYPE SS BICS OTHER THIS SOU'											
FILE NAME/ITEM#	MELD	``	Pi	V 2023	TRAN	TRANSDUCER DUAL SEGL DODEG RANGLE 45°							
XOREF. POINT (Lo)	Yo REF.	POINT (W	<u>.</u>	المامد	SCAN	WIDT	H H	10	·7 ′	ANOLE TO			
SIZING METHOD	ANGL	E Ve	RE	FERENCE C	AL, SHE	ΕŤ		· · · · · · · · · · · · · · · · · · ·	SET-	UP			
1 45/60 DEGREE SHEAR 2 AATT						}			<u> </u>	,			
3 RATT						=							
4 DUAL 0 DEGREE		INID	Č.V.	TION INFO	TALATI								
		AX X MP		LENGTH	X2	Y1	W	DTH	Y2	INDICATION TYPE			
									-				
									}				
							\dashv						
	·												
								ed in	4.5				
REMARKS													
NO CRACIL	LEK	7 2	N	DICA	7 %	νϽ	-						
Examines Level # Date \$ (3) C	Analy: Level	st Voc D		\$ 7) er	-(1	view L/ vel_	er Da	te		Page of			
(NI) SEE ATTAC	CHED I	12.77	<u></u> Ω	_ FROM	ر <u>ت.</u> م	B		nes)					

4/00		····		 									
4700	AUT	OMATED	ULTRASO	NIC THIC	KNESS			•					
	,,,,,,	D				Riser # 31							
LOCATION		SYSTEA	EXAM S	TADT	EXAM EN	D JOB#							
	TANK FORD		PSP-4			0 1950							
COMPONENT ID				EXAMI	VATION SURF	ACE	NOM, THICKNESS						
**************************************		03-AP			SOO DID PAINTED 562"								
CONFIGURATIO	PLP	.TE TO	LATE	CALIBR	CALIBRATED RANGE TEMP								
CIRCUMFERENC	E/TOTAL LENGT	EXAMINED	REF. 16	REF. LEVEL CORRECTION (TRANS. CORR)									
			90.										
PROCEDURE			R		MATERIAL TYPE CONDITION								
FILE NAME/ITEM	<u>- SUUT - !</u>	105-00	7,3		SS SC CS OTHER								
LIFE DAMESTER	゙	ن سوس	D PLATE	. 3	DR r	TRANSDUCER TRANSDUCER SGL TRANSDUCE ANGLE ANGLE SGL TRANSDUCER ANGLE TRANSDUCER TRANSDUC							
Xo REF. POINT (LA	Yo REF	POINT (Wa)	1	SCAN	CCAN MIDTU							
	foez wold	<u>). </u>	CL of Ve	ert Mek	<u>. </u>	11.63							
PART#/ INDICATION	X START	X STOP	Y START	YSTOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABL	MAX. THK.					
0-12				 			KEPURIABL						
) <i></i>	<u> </u>			 	.560"			.570"					
12-24	<u> </u>			<u> </u>	.560"	1841,		570					
24-36	ļ				,565°	·559*	·	, 570*					
36-48					<u>. 565°</u>	1549'		575*					
48-60					.567"	,549*		· 575 -					
60-72					.56%	550		· 575°					
72-84					.569"			,575*					
84-90,4				1	1570"	'2 26.		.575*					
1-1-1-				1	7.570	1750							
							<u> </u>						
	 			 	 		<u> </u>						
				 	 								
													
<u> </u>				ļ <u>.</u>	<u> </u>		ļ						
ļ				ļ <u>.</u>									
						<u> </u>	l						
SUMMARY													
REMARKS					· · · · · · · · · · · · · · · · · · ·								
					, in ,	·							
	· · · · · · · · · · · · · · · · · · ·	·····		······································									
													
Examiner	······································	···	Analyst			Reviewer		Page					
Fiction	Whi	}	Wal	4_ 1	L WI								
Level II I	Date 2 19/0	3	Level	Date 3	4/03	Level	Date	of					
P-SCAN	Li mited.	_			-		<u>-</u>						

(NI) SEE ATTACHED LIETTER FROM J. B. ELDER

4/00			L		ONIC A REF	P-SCAN PORT					F	ZZSER	.31		
LOCATION SYSTEM								EXAM START							
200 EAST TANK FARM PSP-4								NOS MINATO	ON SURFAC	<u> 20</u> F	40	CONDITIO	.03		
103-AP								Ø OD □ID □ PAINTED □							
CONFIGURATION TO DIST								CALIBRATED RANGE C'TO 2.25 TEMP PDB 0F							
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 88								REF. LEVEL CORRECTION (TRANS. CORR)							
PROC	EDURE				F	REV /		ERIAL.							
	<u>ステッヘル</u> AME/ITEM#	SVUT	2172	00%	3		TRA	NSDLIC	CS OTH				<u>562" </u>		
CALE IN	WINELL I CIAH	VERT U	رسعد	PURT	و ع			DUAL	SGL	□ 00	EG 🐔	ANGLE	€0°		
X₀ REI	F. POINT (Lo)		·Yo	REF. POIN	T (Wo)	_	SCA	N WIDT		1.1"					
1 64	SIZING ME	THOD	1 7	NGLE		FERENCE C	AI SH	FET	·	(. 1	SET	IID .			
1 1	5/60 DEGR		-	MAGLE	- K	I ENENCE C	AL, OF	l			OE I	-UF	·· · · · · · · · · · · · · · · · · · ·		
	ATT	LE OHENIX	+		_							<u> </u>	-		
	ATT														
	DUAL 0 DEC	REE													
				11	VDICA	TION INFO	RMA	TION	·						
IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	Wi	DTH	Y2		NDICATION YPE		
					ļ			4							
					ļ			4		•	ļ				
					┖			+-			<u> </u>				
 				<u> </u>			 	 	_+						
	.,		·]				 	—- 			
					 			\pm							
 	<u>-</u> -	 			}	<u> </u>	}		$\overline{}$		}				
 		 			 	 		+	_	<u> </u>			·		
		 		+	†			+	 			$\overline{}$			
			,			<u> </u>		+	-		t	_			
 			•	 		†	T	1							
	MARKS CONCL miner	CZKI		いり <u>x</u> (270	ONS	TR	<u>levie</u> v	— wer			Pag			
Leve	UDF el II Da Scan I		_ 4	evel v			(I	evel	Dat	e		-	of		

NO SEE ATTACKED LETTER FROM I. B. ELDER

4/00														• • • • • • • • • • • • • • • • • • • •	
				U	LTRAS	SON	IC P-SCAN					l		•	
		-			DAT	A R	EPORT						2S	SER 3	? 1
												l			» ı
	ation O <i>Edst</i>	מאל אלו	م ا	SYS	TEM D	SP			M STAI			A END	JOE		
COM	PONENT ID					21.	<u></u>	FX4	MINATI	O910	<u> </u>	10 T	COND	<u>03-41</u>	
-		10	3.	- 13·				-	50 OD			0			
CONF	FIGURATION	PL	7.L. E	_ TO	PL	Δ~	c	CAL	JERATE	O RANGE		-011		TEMP	
CIRC	UMFERENCE/	TOTAL LENGT	H EXA	MINE		9. 4		REF	LEVE	O' す。 L CORREC	TION (TR	ANS, C	ORR)	AmB	
0000	CEOURE		····			7		!						<u>& D</u>	<u> </u>
	<u> </u>	4-5VUT	- Z-	م م دو	007	.3	REV		rerial SS 🛱	CS OT	HER	-	THIC	-562	14
FILE	NAME/ITEM#						1PLATE 3							4 500	
X _c R ^c	F. POINT (Lo)	YCK	1, '	<u>''''</u>	REF. POIN	17W-	1, JAIE:) ('N Mid.	L do SGI	. 🗍 0:	DEG	(ANG	LE 45°	
				L		· fasc	···	30	MA ARID	··· 1	0,7	••			
	SIZING ME			Al	VGLE		REFERENCE (CAL. SH	EET			SE.	T-UP		
	45/60 DEGR	EE SHEAR													
	AATT		\perp												
	RATT	35.F			· · ·	_ _									
4 1	DUAL 0 DEC	SREE					CATIONINE	20844	ਰਨਜ						
IND	METHOD	WELD	DEF	TH	MAX	T X1	CATION INFO	X2	TON Y1	1 10/	IDTH	Y2		INDICATION	781
		SIDE	R. L		AMP	^'	LENGII	1 ^2	' '	"	חוטו	'-		TYPE	JiN
								1	 			1			
												1			
			_			<u> </u>									
	<u> </u>							<u> </u>				<u> </u>			
:															
								 				Ļ.			
		 				-	 	>				 	}		
								 	\rightarrow			 			
						├─-	 				_	-			
				.		1.		 	+-			—	$\overline{}$		
					T	1		1	+			1	\rightarrow	$\overline{}$	7.00
						1		<u> </u>	 			1	- 		_
	MARKS	·								, , ,,,					
	<u>00 c</u>	RACK	<u>L</u>	<u> ۲۱۷</u>	E Z	ッド	CZTAJZO	NS						<u>-</u>	
							<u> </u>			_					
															
Exa	mine			An	alyst			ΙŔ	eviev	ver			ΙÞ	age	=
<u> </u>	12Hr	<u> </u>		4	usle		1) Delson		VI.)			_ '	-50.	
$\overline{}$	el <u>II</u> Dal	te 3/3/0	3.	Lev	el 📉	P Da	te 5 18 0	_	evel	Dal	te		_	of _	
<u> 55</u>	حمد للم	ited													
Ni) 528	A777	A	× ~	1.50	·	~ F0 11~	₩.	72	EIO					

4/00		· · · · · · · · · · · · · · · · · · ·	
AUTOMATED	ULTRASONIC THIC	I &	15er * 31
LOCATION I SYSTE		EXAMISTART EXAMIEND	108#
200 EAST TANK FARM	175P-4	2719/03 0810 1950	03-41
COMPONENT ID 103-AP CONFIGURATION TO		EXAMINATION SURFACE 4☑ OD ☐ ID ☐ PAINTED	NOM, THICKNESS
PLATE 1	ΡιΑπ∈	CALIBRATED RANGE	TEMP OF
CIRCUMFERENCE/TOTAL LENGTH EXAMINED	105,5"	REF. LEVEL CORRECTION (TRANS. C	ORR) DB
PROCEDURE LOGEMA-SVUT-INS- O	07.3 REV	MATERIAL TYPE SS CS OTHER	CONDITION
FILE NAME/ITEM#		TRANSDUCER	
VERT WEL	DIPLATEY	DUAL ☐ SGL 🖸 ODEG	ANGLE
XO REF. POINT (LO) HORZ WELD YORE	t of Vert. Weld	SCAN WIDTH 11.3 "	·
PART#/ X START X STOP	Y START Y STOP	AVE. MIN. THK, AREA THK. R. LIG. REPORTABLE	MAX. THK.
P-12	1	.770" .752"	.790"
12-24		1.770" 1748"	1790"
24-36		.780" .751"	1790"
36-48		.770" .751"	.785"
48-60		,775" .754"	1790"
60-72		1770" 1754"	.786"
72-84		177811,7604	.785"
84-96		1.765' 1.754"	1775"
96-105.5		.765" .737"	775"
	· · · · · · · · · · · · · · · · · · ·		
SUMMARY			
REMARKS			
TEMATIO			
		-	<u> </u>
Examiner U.D. Furdy	Analyst Wesley HX	Reviewer	Page
Level Date 2 19 (03	Level Date 3	14/03 Level Date	of
12-Scan Limited	1 1		
(vi) See Attached Li	etter From	I.B. Elder	•

Att. 2-30

4/00	···•	DATA		P-SCAN ORT							R 31	
LOCATION 200 EAST TANK FARM	SYST	EM P 5P - 4	1		EXAM	STAR	T 082	EXAM	END	JOB	# 1-03	
COMPONENT ID			<u>'</u>		EXAM	INATIC	on Suri	FACE	- 1	CONDI	TION	
CONFIGURATION	TO	<u> </u>			CALIB	RATE	L ID D RANG	PAINTE!	<u> </u>		TEMP	
PLAT	15	PLY	746	<u></u>	1 .	(ပ " ာ	ru 3.	0		AMB	٥F
CIRCUMFERENCE/TOTAL LENGTH E	XAMINED) Jo3	3.1	41	REF. I	LEVEL	CORRE	CTION (TR	ANS. C	ORR)	۵,	DB -
PROCEDURE			IR	EV		RIAL T						
COGEMA-SVYT-Z	1722 -	<u> </u>	<u> </u>			SDUCE	CS (<u>.750</u>	<u> </u>
VERT.	بادر	<u>.up/</u>	PLE	LTE 4		DUAL	. .≱ ⊠ s	GL 🗆 OE	DEG :	🐧 ANGI	Ε <u>ΦΟ</u>	
XOREF. POINT (LO) 1' below HORZ weld Lot yent weld SCAN WIDTH 10,9"												
SIZING METHOD	A۱	IGLE	RE	FERENCE C	AL. SHE	ET				T-UP		
1 45/60 DEGREE SHEAR												
2 AATT		· · · · · · · · · · · · · · · · · · ·	<u> </u>									
3 RATT			ļ			[
4 DUAL 0 DEGREE		INI		TION INFO	RMATI							
	EPTH R. LIG.		X1	LENGTH	X2	Y1	T	WIDTH	Y2		INDICAT TYPE	ION
									<u> </u>			
									<u> </u>		<u>.</u>	
									├ -			
			_						 			
									1			
									<u> </u>			
									-		 :	
								· · · · · · · · · · · · · · · · · · ·	 	\rightarrow		
		 				\vdash	-+		 			
REMARKS		l		<u></u>	L	L			1			
NO CRACK L	51215		200	02760	<i>∞</i>)८							
Examiner		alyst	_ <u>} .7</u>	\sim		view	er/			P	age	
Level II Date 2 10/03		Holy	22	5/19/03	: 42	vel_		ate		-	of	
P-Scan Limited	. re,	.e. 7477		2117103	Le	A C1 _		ale			o	
N) SEE ATACAC	0 4	シカア	ر (form.	Z, B.	. 15	/ UF	X				

Att. 2-31

4/00		•					P-SCAN PORT						K ZÆ	R 31
	ATION C TEAST I	BANK TEN		SYSTEM	De	5 P - L	}	EXAM	START	0910	EXAM	IEND	J08#	3-41
CON	PONENT ID		_	n 0		<u></u>	1	EXAM	INATIO	N SURFAC	E	- 10	CONDITION	
CON	FIGURATION		3 -	TO				CALIE	RATED	□10 □1 RANGE				MP
CIRC	CUMFERENCE/	TOTAL LENGT	H EXAN	ALL DE D	70.7		55.0	REF.	LEVEL (CORRECTION	2 ON (TR	.12" ANS. CO	RR)	AmB o
	CEDURE						37. 6" REV		RIAL T		- :		&	
FILE	O C C M C NAME/ITEM#						!	TRAN	SOURCE	CS OTH				150"
VE	EF, POINT (Lo)	ED/	45	PLA Yo REF	TE 4	1 4	4A		DUAL	6 ₹SGL			ANGLE _	150
										1	0.9			
1	SIZING ME 45/60 DEGR		,- -	ANG	LE	R	EFERENCE C	AL. SHE	ET		· · · · · ·	SET	-UP	
	AATT	ice orient	`			-			-					
	RATT													
4	DUAL 0 DEC	GREE			11	IDIC4	TION INFO	RMAT	ION					- -
IND	METHOD	WELD SIDE	DEP R. LI		MP	X1	LENGTH	X2	Y1	Will	TH	Y2	IND	ICATION PE
 									ļ			<u> </u>	-	
 	-				-					-		<u> </u>		
]							ļ		
 	 											-		
ļ							<u> </u>					<u> </u>		
							 		-		_		$\overline{}$	
					2 .		1	13.4.1.41			Na .			
	MARKS		L		l	L	<u> </u>	<u> </u>						
1	O CRA	داد لـ	ادك	_Xoi	DZ	LAT	2002							
]	A 5720													
Exa	mine	. Ju		Analy (UL)	rst - P	1) r	ກ.,	Re	view	er-	 -		Page	 -
	rel II Da		23	Level	N	Date	5/12/03		vel_	Date			-	of
N			70円	2.0	Γ <i>1</i> Σ.	TFV.	2 Feor	, <u>, ,</u>	B.	を 「ひ	<u> </u>			

4/00					SONIC A REF	P-SCAN PORT					R	SISER 31
LOCA				SYSTEM	4.5		EXAN	STA		EXAM E		JOB#
	EAST TA			P59-	٦		EXAN		0750 ON SURFAC	<u> /03</u> F		MOITIDAO
000		10	<u> 3 -</u>	A P] OD			`	
CON	IGURATION	PLA	TE.	то			CALIE	RATE	DRANGE	.24"		TEMP PMB of
	UMFERENCE/I	OTAL LENGT	H EXAM	WINED 3	.8"	·	REF.	LEVE	CORRECTI	ON (TRAN	is. co	RR) B
PROC	EDURE	-SJIUT	-T ~\	5-007.	3 8	REV ,	MATE			ED	772	¥. 1750".
FILE	VAME/ITEM#			. 1			TRAN	SDUC	ER			
Ya RE	F. POINT (Lo)	PLAT		Yo REF. POIN	GE A		SCAN	DUAL	L ⊅SGL		3 &	ANGLE 45°
				<u> </u>	G G					8.9	• •	
	SIZING ME			ANGLE	R	FERENCE C	AL. SHE	EΤ			SET-	UP
_	45/60 DEGR	EE SHEAR										
	AATT RATT	· · · · · · · · · · · · · · · · · · ·										
	DUAL 0 DEC	SRFF										
<u> </u>	00/12/0/02/			1	NDICA	TION INFO	RMAT	ON	I			
IND	METHOD	WELD SIDE	DEP R. LI	TH MAX	X1	LENGTH	X2	Y1	WIE	TH	Y2	INDICATION TYPE
1			N 2	<u> </u>	1.95"	1.42"	3.37"	_	/:	50	_	G0444 0,2.
ļ					<u> </u>							
<u> </u>			· · · · · ·		 	 	-					
					 		 	-				~
ļ					<u> </u>	ļ	ļ <u> </u>	<u> </u>				
-					ļ	ļ		ļ				<u> </u>
					 		<u> </u>	-				
				 -	 		 					
					 	· ·			 -	 	-	
1	MARKS											
						NOT F				<u> </u>	270	. <u>~</u>
220	AX TUD:	THE	كمادي	M WOLL	- 12°C	ED C	שאנכ	T.C.	<u>, , , , , , , , , , , , , , , , , , , </u>			
N	O CRAY	KLZKI	<u>, z</u>	TADICA	Cre							
	mine			Analyst		7		viev	ver			Page
		101	-	Wesle		Lel	W					
Lev	el <u>a⊏</u> Da caw Lim	te <u>≰6/0</u>	۱ ۲	rever	Date	2)3118	Le	vei_	Date	<u></u>		of
	CON LIM	יינהם										_L

NO SEE ATTACARD LISTER FROM I. B. ELDER

1 4400								
4/00	AUT	OMATED U			NESS			
			TA REPO	RT				liser# 31
LOCATION RUD EAS	TONK DA	SYSTEM	PSP-L	1	EXAMS	TART	EXAMEND 1950	JOB# 03-41
COMPONENT ID			•	1		ATION SURF		NOM. THICKNESS
		103-A1				00 🗆 ID [PAINTED	.875"
CONFIGURATION	PLAT	TE TO P	CATE		CALIBR	ATED RANGE	1.70"	TEMP AMB OF
CIRCUMFERENC	E/TOTAL LENGT	H EXAMINED	21.	6"	REF. LE	VEL CORRE	CTION (TRANS. CO	ORR) 👌 DB
PROCEDURE	<\!UT-	T.115- 01	77 > RI	EV .		IAL TYPE	THER	CONDITION
FILE NAME/ITEM	il.				TOANO	DUCER	inex	
	V	ERT. U		LATE		UAL S	GL AC ODEG [ANGLE
XaREF. POINT (L.	W 590H	ed Yorke	OF JOH	r wad	SCAN V	VIDTH	11,4%	<u></u>
PART#/ INDICATION	X START	X STOP	YSTART	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX, THK.
0-12	-		•		.865"	852"		.880"
12-21.6			T		186211	844"		1870"
		:			, 0			
			 					
			1			· · · · · · · · · · · · · · · · · · ·		
 			1.2					
		· · · · · · · · · · · · · · · · · · ·			<u>-</u>			-
				 				
			 					
·			 					
		· · · · · · · ·		<u> </u>				
 		·	 	<u> </u>				-
			<u> </u>					
			ļ					
SUMMARY						• •		
REMARKS	<u></u>	L		<u> </u>			L	
11,411,111,10		<u> </u>						
•					 			·
				<u> </u>	•			·
-					· · · · · · · · · · · · · · · · · · ·			
Examiner	. 1.1		nalyst	-1/27		Reviewer		Page
Level II [Date 2/19/		Nesle	Date 3/17		<u>(NI)</u>	Dolo	of
P-Scan	Limited	ا د	evel NV	Date 2/17	105	_evel	Date	- °
			11			<u> </u>		
W) See	HHAC	red Le	4464	Franc	. <i>2. B</i>	.Elde	<u>r</u>	

4/00			·	DAT	ONIC A REF	P-SCAN PORT						ISER 31
LOCA		BONE FO	SY:	STEM >>	5 9 -4	•	EXAM	STAR	व्हर	EXAM EN	D JO	8# 03-41
COM	PONENT ID					<u> </u>	EXAN	UNATIO	ON SURFACE		CON	DITION
CONF	IGURATION	10	3 - P	112			CALL	OD	□ ID □ PA D RANGE	INTED		I TEMP
ļ		PLA	37.	19	78_	<u> </u>	ļ	(ש" דט	3.5	· ·	AmB of
CIRC	UMFERENCE/	TOTAL LENGTH	EXAMINI	19	<u>, ı "</u>		REF.	LEVEL	CORRECTION	(TRANS	S. CORR)	∆ DB
	EDURE	1.5VUT.			F	REV		RIAL T			THIC	875 "
	NAME/ITEM#	· · · · · · · · · · · · · · · · · · ·				_`	TRAN	SDUC	ER			1 40
Y, DS	F, POINT (Lo)	VEXT.	WE.	REF. PQIN	475	>		DUAL	u .	ODEG	MA E	GLE 60°
^° \	elow Ho	ez weld		407	Vert.				<u> </u>	.7_		
	SIZING ME	THOD		ANGLE		FERENCE C	AL, SHE	ĒΤ		5	SET-UP	
	45/60 DEGR	EE SHEAR	-		_	-				<u> </u>		· · · · · · · · · · · · · · · · · · ·
	AATT				+							
<u> </u>	RATT DUAL 0 DEC	REE					. 					
7-	DUAL O DEC	TICE		11	VDICA	TION INFO	RMAT	ION				
IND	METHOD	WELD SIDE	DEPTH R. LIG,		X1	LENGTH	X2	Y1	WIDT	HY	2	INDICATION TYPE
				-94B	5,18	-3.66	8,1		-2.0	3		(N2)
			· · · · · · · · · · · · · · · · · · ·		<u> </u>	2.927	-			_		
						200		ļ				
			···		 			 -				
······································		 -		 				 				
			·	 								
												
 			·									
			· · · · ·	1	ļ·		-	_			<u> </u>	The state of the s
				+			 -					
REA	AARKS 2) IV	DECA	750	الم ح	יצמי	ram -	<u> </u>	0.	ع م	ا ۵۵	AVE	LUATEDY
												
Exa	miner	5 1.	19	nalyst	"#) ;	7).,	Re	view	er		Ī	Page
Levi	el <u>#</u> Da	te 3 [19]	_ 4	evel W		5/20/0	3 Le	vel_	Date_		_	of
<u>~~</u>) SEE	ATTA	CHE.	O LIE	LFX.	teon	7 -7.	B	، حرب	Ω		

COMPONENT ID CONFIGURATION CIRCUMFERENCE/ID PROCEDURE COGENA: FILE NAME/ITEM# Xo REF. POINT (Lo) I" BRLCOS LAB SIZING ME 1 45/60 DEGRE	PLA THAT SVUT THAT SEE WELL THOD	EXAMINED EXAMINED (NS- Yof	PLA PLA PLA 207, =	72 //" 3 F	REV [EXAM EXAM CALIB REF. I	OD D	S 1 SURFACE ID PAINT ANGE To 2: RRECTION (T	5 "	JOB# NI-03 CONDITION TEMP AMB ORR)
COMPONENT ID CONFIGURATION CIRCUMFERENCE/TO PROCEDURE COGENOR FILE NAME/ITEM# Xo REF. POINT (Lo) 1 Ballow Libits SIZING ME 1 45/60 DEGRE	PLA THAT SVUT THAT SEE WELL THOD	EXAMINED EXAMINED (NS- Yof	PLA PLA 207, =	72 //" 3 F	- 1	CALIB REF. I	INATION: OD D IRATED R LEVEL CO	SURFACE ID □ PAINT ANGE To 2. RRECTION (T	ED	TEMP AMB
PROCEDURE PROCEDURE COGENTA FILE NAMERITEM# Xo REF. POINT (Lo) 1" BRLUS LB SIZING ME 1. 45/60 DEGRE	PLA OTAL LENGTH SVUT -3 VERT. VERT.	EXAMINED EXAMINED (NEW)	PLA 2007. = 145/1	7/" 3 F	- 1	REF. I	RATED R	ANGE To 2- RRECTION (T	5 "	ORR)
PROCEDURE C.O.G.E.M.A. FILE NAMERTEM# Xo. REF. POINT (Lo) 1" BRLUGG LAB SIZING ME 1. 45/60 DEGRE	SVUT -3 VERT. Pr. Weir THOD	EXAMINEC	207. 3 145/3 REF. POINT (7/" 3 F	- 1	MATE	LEVEL CO	RRECTION (T		ORR)
FILE NAME/ITEM# Xo REF. POINT (Lo) 1" Ballow List SIZING ME 1. 45/60 DEGRI	VERT. RE. WELL THOO	COEUD YoF	745/3 REF. POINT (ZAI	- 1	MATE		`		
FILE NAME/ITEM# Xo REF. POINT (Lo) 1" Ballow List SIZING ME 1. 45/60 DEGRI	VERT. RE. WELL THOO	COEUD YoF	745/3 REF. POINT (ZAI	- 1	C SS	RIML I I F	=		
Xo REF. POINT (Lo) 1 Ballow Has SIZING ME 1 45/60 DEGRI	er. Weir THOD	. Y₀ F	REF. POINT (ZAT	مسم 11-		S S CS		T	Ak., .875"
SIZING ME	THOD)	d ce i	Wo)	<u> </u>	TRAN	SDUCER DUAL 1	SGL [ODEG 4	SI ANGLE 45°
SIZING ME	THOD	Al	TO CT			SCAN	HTGIW		,8"	
1 45/60 DEGRI	EE SHEAR		NGLE		FERENCE CA	AL. SHE	ET			ſ-UP

2 AATT 3 RATT		-		╂			-		··· ·· ···	
4 DUAL 0 DEG	REE			+						
			,		TION INFO					
IND METHOD		DEPTH R. LIG.	MAX ;	X1	LENGTH *	X2	Y1	WIDTH	Y2	INDICATION TYPE
			-							
	$\overline{}$									
									1	
										7
				>				 	_	
								+	 	
								<u> </u>		
		· · · · · · · · · · · · · · · · · · ·	-					<u> </u>	+	
								. 1	+-	\
REMARKS NO CON	14 15	213	ZNOS							
						<u> </u>				<u> </u>
Examiner	de	_ //	alyst	Đ	Qu_		viewer			Page
Level # Dat	e <u> 2/26/03</u> mitedi.	Lev	ver [Date	5/21/03		vel	Date_		of

C-116.6								·
4/00	AllT	OMATED U	TRASON	HC THICK	(NESS			•
1	7.01		TA REPO				[Riser #31
LOCATION		SYSTEM			EXAM:	START	EXAMEN	D JO8#
200 EAST COMPONENT ID	TONK FOR	<u>n l </u>	PSP-4		2/25/	03 0 74 NATION SURF	0 1345	NOM, THICKNESS
COMPONENTIO	10	3-AP				OD [] ID [875"
CONFIGURATION	N _	ΤΟ ͺ			CALISE	VATED RANGE		ŢĔMP
615511115555116	PLATE		who km		055.1	3" TC	1.0 "	AMB OF
CIRCOMFERENC	E/TOTAL LENGT	H EXAMINEU	(20"		REF. U	EVEL CORREC	CTION (TRANS	DB
PROCEDURE	، حدادات	7110 00	R	٧,		RIAL TYPE		CONDITION
CHE LIGHTELE	<u> SVUT- :</u>				75.110	Øcs o DUCER	THER	
FILE WASSINESS	14022.	سعيه /	KNUCK	عيد .	100 N	DUAL S	SL OT ODEG	ANGLE
Xoref. Point (10), 2+Vert W+1	Yo REF. F	OF HOB!	e weld	SCAN	HTOIW	9.8^:	
PART#/ INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABL	MAX, THK.
Ø-12			•		.869"			. 88°°
12-24					·870"	1864"		, 8%"
24-36					1870"	852"		1880"
36-48					1870"	1859"		·880°
48-60					18700	.864"		,880"
40-72	i ·				1870"	,862"		1880"
72-84					1870"	18652		් පිළුව"
84-96					,970"	.864°		,880°
96-108					18704	1863"		1880"
108-120			Ť		1870"	.862"		୍ୟ ଓଡ଼ "
								<u> </u>
					1			
		-						
SUMMARY								
				 				
REMARKS						. * .		
]	PLATE	STOF						
					•			
			· · · · · · · · · · · · · · · · · · ·				9	
Examiner		1/	nalyst		T	Reviewer		Page
MDH			<u> Neslei</u>	D Z Jel		(u)		
	Date 2/25/0	23 [evel vz	Date 3/1	3/03	Level	Date	of
PSCON L	imited				1			· \ \

W) See Attached Letter From J. B. Elder

4/00				 	······································					
	AUT	OMATED U			KNESS		1			
	<u> </u>		TA REPO	RT			121	ser # 31		
LOCATION 200 EAST	TANK FAI	2M SYSTEM	PSP	. y	2/25	START 103 671	EXAMEND 10 1345	JOB# 03-41		
COMPONENT ID					EXAM?	NATION SURP	ACE	NOM, THICKNESS		
CONFIGURATIO	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	103-0				00 □ ID (PAINTED	1.937		
Į	PLATE	. 10 K	NUCKL	15	CALIER	ATED RANGE	1.0"	Amb. of		
CIRCUMFERENC	E/TOTAL LENGT	H EXAMINED	20"		REF. LE	VEL CORRE	CTION (TRANS. CO	RR) Ø DB		
COSEMA-	SVITT- T	NS - 00	7. 3. R	EV 1		IAL TYPE SC C	THER	CONDITION		
FILE NAME/ITEM	I#		, , , , , , , , , , , , , , , , , , ,	·•····································	TRANS	DUCER				
V 555 500 7	HOUS	<u>, wew</u>	<u> </u>	۲۰۰۶		DUAL DS	GL 🔀 ODEG 🗆	ANGLE		
Xo REF. POINT (Polyte de s	U'en CL	7 #V03	Meru	SCAN	MIDIN C	1.8"			
PART#/ INDICATION	X START	X STOP	YSTART	YSTOP	AVE, THK,	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.		
0-12			 		1937"	1919"	Title Ottivided	.945"		
2-24			<u> </u>		1935	1901"		1940"		
24-36					19381	929		,940		
36-48				<u> </u>	.940"	1926"		1945"		
48-60					1945	929"		1950°		
60-72			1		.940"	1924"		,955		
72-84					1950"	1923"		1955^		
84.96					,945"	1919"		1955		
96-108					,950"	1941"		1955^		
108420				<u>l</u>	,950°	1961"		1955"		
İ				<u> </u>						
				<u> </u>	<u> </u>					
<u> </u>		<u> </u>				<u> </u>				
					ļ		ļ			
SUMMARY			1			· .				
5514514		<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>		
REMARKS			<u></u>	·						
l	KN	WALK	220K		·			,		
	<u>. </u>	 	<u></u> -		<u>•</u>			·		
				· <u>-</u>	· ·	 .				
Examiner	\		Apalyst			Reviewer	· · · · · · · · · · · · · · · · · · ·	Page		
WIST	udul	6	Veolas	# The		NI				
)ate 2/35/c				303	Level	Date	of		
P-Scaul	evel I Date 2/35/03 Level Date Date of of									

(N) See Attached Letter From J. B. Elder

	D ULTRASONIC THIC DATA REPORT		·	·	Riser#31
LOCATION SYS	P5P-4	Z lan	tart 0 3 075£	EXAME	
COMPONENT ID		EXAMIN	NATION SURF	ACE	NOW THICKNESS
CONFIGURATION TO			OO () ID (ATED RANGS		.875" TEMP
CIRCUMFERENCE/TOTAL LENGTH EXAMINED	KNUCICLE	FEE 15	3" TO	1.0*	E E COSS
CIRCUMPERENCE TOTAL EETIGTT EXAMINED	120"	Har. Ct	YEL CORREC	MOR (IRA	
COGEMA-SULT-INS-00	REV N		IAL TYPE	TUSO	CONDITION
FILE NAMENTEMS HORZ. LOSLE	1 ^	TRANS	DUCER		G DANGLE
KNICKLE SIGO NOTH OF 24" EIGH	TEF. POINT (Ya)	SCAN		10";	
PART#/ X START X STOP	YSTART YSTOP	AVE.	NIN. THK,	AREA	AHT XAIA
INDICATION O - 12		THK.	R. LIG.	REPORTA	.875*
12-24			\$52" .852"	· · · · · · · · · · · · · · · · · · ·	.৪75
24-36		1854"	'825.		.865"
36-48		.854"	1852"		,865"
48-60			.847*		.845-
60.72			.850"		.865"
72-84		. 853"	.851"		.865"
84-96		,851"	.844"		.865"
96-108		,950"	.846		,865
108-120		.848"	.838″		.860"
SUMMARY					
REMARKS		L			
PLAT	E SIDE		· · · · · · · · · · · · · · · · · · ·		
					
Examine Dundy	Analyst Wester Dec		Reviewer		Page
Level II Date 2/20/05 P-Scan Limited	Level 7 Date 4	2103	evel	Date	of
W See Attached L	etter From :	5 R 5	1200		

4/00						•
AUIC	MATED ULTRAS DATA RE		NESS		1	N +
LOCATION	SYSTEM		EXAM	TEAT	EXAMEN	<u> </u>
200 EAST TANK FALM		'	2/20	03 0755	1430	
COMPONENT ID 103 - A			EXAMI	NATION SURFA	(CE	NOM, THICKNESS
CONFIGURATION	TO		CALIBR	OD DID C	JPAINTEU	TEMP
PLATE			1	.31 70	0 1.0"	PMG OF
CIRCUMFERENCE/TOTAL LENGTH	120		.1	EVEL CORREC	TION (TRANS	& }D3
COGENA - SVUT- IN	S-007.3	REV	MATER SS	IAL TYPE GC CS OT	HER	CONDITION
1 これに かんいきりてきいき		CHIEA	TRANS	DUCER		
Y. REE POINT (LANST VONT LUC	Ye REF. POINT (V.	OLTER IT	SCAN V	DUAL SG	17	ANGLE
Knuckle Side North of 24	"elser that	Holz MeA		10	<u>) i</u>	
PART#/ X START INDICATION	X STOP Y STA	SI LOIDE IA	NE. THK.	MIN. THK, R. LIG.	AREA REPORTABL	MAX. THX.
0-12			940"	.927"		.950"
12-24			937	.887		945
24-36			935	.922		.945
36-48			435	.921		1.945
48-60		.	934	.914		.945
60-72			934	.920		•945
72-84		- 1	935	.928		-945
84-96		! .	935	.916		•945
96-108			936	.926		,945
108-120			938	.906		,950
			<u>-</u>			
			•			
SUMMARY	Ì					
REMARKS				L		<u> </u>
	JCKLE SIE) E				
) C/\ L \ 310	<u> </u>			<u></u>	
Examinar	Analyst	la De	حر ا	Reviewer		Page
Level IL Date 120/05	Level	Date_5/21			Date	of
P-Scan Linited	.		ا جعا			
(N) See Attached	Letter F	rom J. B.	E.190	24-		

4/00	-		U		ONIC A REF	P-SCAN PORT						ÇZ SEB	.31
LOCATION 200 EAST TO	مالا فحم		SYST	1EM P59-	4		EXAM	STAR	2850		END	JOB#	.o3
COMPONENT ID		3-					EXAM	INATIC	N SURFAC	Ē		CONDITIO	
CONFIGURATION			TO					RATE	□ID □I RANGE				TEMP
CIRCUMFERENCE/	PLA.		MINER	<u>kn</u>	م کرارک	<u>بر</u>	DEE	EVEI	To CORRECTI	2.7	5 "	1001 .	BMA
			2	3.41"		05,4"			•		A110. UC		DB DB
PROCEDURE COGEMA	-5747	・エド	S -	007.	3	REV		RIAL T		ER	77	4k	375"/.93
CILE MAMERTEMA						'a ^	TRAN	COLICE					
Xo REF. POINT (Lo)	12 Vent	eld.	·YoR	EF. POIN	T (Wo),	<u> </u>	SCAN	WIDT	1	10	/LG •C	N VIIOTT	
auckle side SIZING ME	Derth of 2	4 <u>., 6₁3</u>	<u>λ-</u> Δ1	ائل ر NGLE	of He	<u> 代表 , Weld</u> EFERENCE C	AI SHE	FT T		10	SET	JIP	··· -· ·· ··
1 45/60 DEGR						LI LINLINOL V	CE, OHE		 			- <u> </u>	
2 AATT													
3 RATT		_											
4 DUAL 0 DEC	REE	L_			ADICA	TION INFO	RMAT	ION					
IND METHOD	WELD SIDE	DEF R. U		MAX AMP	X1	LENGTH	X2	Y1	WI	OTH	Y2		IDICATIO
				,	<u> </u>		-				ļ		
								-			-		
								<u> </u>					~
											<u> </u>		
								<u> </u>			 		
	<u> </u>				\vdash						 		
		 			 			<u> </u>			<u> </u>	-	>_
			•	 	+			 -	-		+		
REMARKS	1			<u> </u>		!		<u>. </u>			<u> </u>	ŀ	
NO C-R	ACK	<u> </u>		l≤ ∑ alyst	761	DZCATI		view	er			Pag	ge
WDFdu Level <u>at</u> Da P-Segy Un		03	Le	vel <u>IIL</u>	Date	5/21/	- Q	vel_	Date	<u> </u>	-	-	of

4/00			U		ONIC A REF	P-SCAN PORT					<u>.</u>		Rzse	ir 31	
LOCAT			SYS	TEM			П	EXAMST 3/4/83	ART		EXAM	END	JOB		
	ONENT ID	NK FARH		P39-	7		4	S/4105	TION	V SURFAC	14	<u>30</u>	CONDI	I-O3	
		103	- A					⊠ 0	DГ	TID CIL	PAINTE		CONO	ION	
CONFI	IGURATION		то	_				CALIBRA	TED	RANGE	٠ س ر	•		TEMP	
CIRCLI	MEERENCE/T	TLATE OTAL LENGTH	FXAMINE	D KV/	ACKL		\dashv	REF LEV) /FI C	ORRECT.	ION (TR	ANS C	ORRI	Amg	• oF
Oilloo	MI LIVEITOLI	Ψ1/14 EE(10111		120"	•			INCI . ECT		ONICOT.		110. 0		_&_	DB
PROC	EDURE	~ \ .			1 F	REV .		MATERIA	IL TY	PE		-70	<u></u>	COL!'	0-1-4
FULL	LARACATERA#	-SVUT-1					\dashv	TRANSD			<u> </u>			ຮນ? <u>,</u> ‡	<u> 757</u>
110011		1002. W	رطنه	145/k	au c	KE		□ DL	JAL	≸SJ SGL	[] OD	EG 🤻	S ANG	LE 45	,
				REF. POINT	r (Wo)			SCAN W	DTH		11.2				
	SIZING ME	E& LE 2 (E		NGLE	94 30	هر، دن نوره EFERENCE C	<u> </u>	CUEET	-		31.0		T-UP		
		EE SHEAR	A	NOLE	KI	בו בתבוזטב ט	<u>~</u> _	SHEET	+		·	عد ا	1-01		
—	ATT	LE SHEAR							+						•
	RATT		+						+					•	
	DUAL 0 DEG	REE			-		-		- -						
 	70,12002	···	1	11	NDICA	TION INFO	R	MATIO	N						
IND	METHOD		DEPTH R. LIG.	MAX AMP	X1	LENGTH	7	(2)	/1	Wi	DTH	Y2		INDICA TYPE	TION
\square							Γ	ì				i			
			_	<u> </u>	.	<u> </u>	上				· ·				
							L					<u> </u>			
	·			 _ `		<u></u>	L					<u> </u>			
		<u> </u>					┞					 			
		<u> </u>				ļ	╞	$\overline{}$							
\vdash				 	 		╀╌	}-	_	_		-		· · · · · · · · · · · · · · · · · · ·	
\vdash		 			 	_	╂-	 -		\rightarrow	_				
	<u></u>			 	-		╀╌			- - -	_	_			
					-	 	╂╌					<u> </u>	\		
 	·			+	 	 	╁	 				 			
REM	MARKS	LL		<u> </u>		<u> 1</u>				,.L .	·····	<u> </u>			<u> </u>
										•					
					·		_	······································							
Leve	miner Da	te <u>37 4/0</u> -	_ //	nalyst evel	Date	74_ 5/21/03		Revi			e		- -	age c	of

ND SHE ATTACARD LIETTER FROM I'B. HIDER

DATA REPORT CALIFORNIA DATE DA	4/00			U	LTRASC DATA		P-SCAN				•	Pro	** 51	
200 SEST TANK FARM PSP-4 COMPONENT ID OS - AP COMPONENT ID OS - AP CONFIGURATION TO CRICUMFERENCE/TOTAL LENGTH EXAMINED V9,2" + 68.6" REF. LEVEL CORRECTION (TRANS. CORP.) DB PROCEDURE COGNETION - STUTY-XNS - 007.3 REV MATERIAL TYPE COGNETION - STUTY-XNS - 007.3 REV MATERIAL TYPE TRANSDUCER TRANSDUCER TRANSDUCER TRANSDUCER SCAN WIDTH SCAN WIDTH 8 SCAN WIDTH 8 SET-UP 1 45/60 DEGREE SHEAR 2 AATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE TRANSDUCER INDICATION INFORMATION IND METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS NO CRACK CEVIL TOODS CATERONS A STADUD & 47" OF A EXAMINED EXAMINED REVIEWER REPLEVEL CORRECTION (TRANS. CORP.) DB REVIEWER TRANSDUCER TRANSD												1~25	er) /	į
COMPONENT ID CONFIGURATION MATERIAL TYPE CONFIGURATION CONFIGURATION MATERIAL TYPE CONFIGURATION CONFIGURATION MATERIAL TYPE CONFIGURATION CONFIGURATION CONFIGURATION MATERIAL TYPE CONFIGURATION CONFIGU			- **		TEM	1						ND JC	_	
CONFIGURATION TO CIRCUMFRENCETOTAL LENGTH EXAMINED PROCEDURE COGESTAN SULT SINS - 007. 3 REV MATERIAL TYPE TRANSDUCE TRANSCUCE TRANSCU	COM	PONENT ID	·			7		3/10	/ <u>/ /3</u>	ON SLIBEACE	134			
CIRCUMFERENCETOTAL LENGTH EXAMINED PROCEDURE COGENDA-SVUT-2/SS - 007. 3 REV MATERIAL PROCEDURE LIGORZ . LILLED (15) KNUCKLE A A A! SORRE POINT (16) STRAYSOR POINT (18) SIZING METHOD ANGLE REFERENCE CAL SHEET SET-UP REV SIZING METHOD ANGLE REFERENCE CAL SHEET SET-UP REV SIZING METHOD ANGLE REFERENCE CAL SHEET SET-UP INDICATION INFORMATION INDI METHOD WELD SIDE R. LIG. AMP INDICATION INFORMATION REW REPARKS NO CPNK SYLL TOOS CATSONS ALL STROYED & 47" OF A Examiner Analyst LULLAL D. TO. Rev. REPLEVEL CORRECTION (IRANS. CORR) AMTERIAL PROCEDURE TRANSCOURCE TRANSCOURCE TRANSCOURCE SCAN WIDTH SCAN WIDTH 8 SET-UP INDICATION INFORMATION TYPE INDICATION INFORMATION TYPE REMARKS NO CPNK SYLL TOOS CATSONS ALL STROYED & 47" OF A Examiner Analyst LULLAL D. TO. Reviewer Reviewer Reviewer Reviewer Reviewer Reviewer ROUN Page			10	3 - A	P		•	- ~ E	00	□ID □ PA	INTED	1000	SITION	
REFLEVEL CORRECTION (TRANS. CORR.) DB PROCEDURE COCEMAL SUATIONS - 007.3 REV MATERIAL TYPE FILE NAME/TEMBY 1 HORZ. WILLS VIJ. YOREF. PINT (W) XOREF, POINT (L.) STRANGUER 1 SSL MOST NOT NOT NOT NOT NOT NOT NOT NOT NOT NO	CON			TO				CALI	BRATE	D RANGE			TEMP	
PROCEDURE COGEMA-SULT-SIS-007.3 REV MATERIAL TYPE SS EDCS OTHER TAK. 4775'4,937' FILE NAMESTERME SS EDCS OTHER TAK. 4775'4,937' TRANSDUCER ODGS ED ANGLE 115' XA REF, POINT (La) STRANSDUCER ODGS ED ANGLE 115' SIZING METHOD ANGLE REFERENCE CAL. SHEET SET-UP 1 45/60 DEGREE SHEAR SET-UP 2 AATT SIDE INDICATION INFORMATION SIDE R. LIG. AMP X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE INDICATION TYPE SET-UP SET-UP SET-UP SET-UP REMARKS NO CPACE SYLL SOCIAL SHEET SET-UP SET-UP SET-UP REMARKS NO CPACE SYLL SOCIAL SHEET SET-UP SET	CIDC	- INSCEDENICED	TOTAL LENGT	UEVALDNE	_ <u> </u>	CE	<u>L.E.</u>	OCE	<u>C</u>	<u>Ут. Э.</u>	65	5 605m	₽WB	٥F
PROCEDURE COCKTAND SULVEY TAKE 937 FILE NAMEDITEMB LIORZ LUEDD VS KUNCKLK A A A I SCAN WITH BOTH SOLD TO FREE PINT (MG) VERT VALO VALUE STOLD A BUT SULVEY TO FEE PINT (MG) SIZING METHOD ANGLE REFERENCE CAL. SHEET SET-UP AS RETO INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION INDICATION INFORMATION SIDE R. LIG. AMP INDICATION INFORMATION REMARKS NO CPACE SYLL TANDS CATERASS A I STARTURE STOLD START SALE A Page Examiner Analyst WINDICATION Page REVIEWER REVIEWER REVIEWER REVIEWER REVIEWER Page WILD Page WILD Page REVIEWER REVIEWER REVIEWER REVIEWER Page	CIRC	OMERENEMOEN	IOIAL LENGI	IN EXAMINE	9.2" a	+ 6	8.6"	REF.	CEVEL	. CORRECTION	v (TRAN	S. CURR)	\(\)	18
FILE NAME/TIEMS A						F								
ADDICATION INFORMATION INDICATION INFORMATION INDICA	<u>ڀ</u>	<u>ama</u>	<u>-6747</u>	<u>-21/25 -</u>	007.	3		□s	SK	CS OTHER	<u> </u>	THK.	.975 4 .9	37^
REMARKS NO CRACK SUL TWO CATES AS A CONTROL OF THE POINT (L.) REMARKS NO CRACK SUL TWO CATES AS A CONTROL OF THE POINT (L.) REMARKS NO CRACK SUL TWO CATES AS A CONTROL OF THE POINT (L.) REMARKS NO CRACK SUL TWO CATES AS A CONTROL OF THE POINT (L.) REMARKS NO CRACK SUL TWO CATES AS A CONTROL OF THE PAGE Examiner Analyst Will The Control of The Page Value of The Page Pa	FILE	NAME/II EM#	7 Laifer	Justin	ALLENI K	Α.	. Δ <i>i</i>	IRAI	NSOUC	ER ————————————————————————————————————	□ onec	: ⊅₹TAN	are 45°	
SIZING METHOD SIZING METHOD ANGLE SET-UP ASSO DEGREE SHEAR 2 AATT 3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD SIDE R. LIG. AMP INDICATION IND METHOD SIDE R. LIG. AMP INDICATION TYPE INDICATION TYPE REMARKS NO CRACK CELL TWO CATEDOS All STARTO & 47" OF A Examiner Analyst WIGH HTML Analyst WIGH HTML Reviewer Page WIGH HTML Reviewer Page	X ₀ Rf	F POINT (LA)	CTOATING	AD 1.Ya1	REE POINT	™.\	•	I SCAI	WIDT	H _ ≯	0010	N VIA	<u> </u>	
1 45/60 DEGREE SHEAR 2 AATT 3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS	VERT	METO KAI	CKF 220F	7 71	ط ه	FHO	يور سور			8				
2 AATT 3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS NO CPACE SYL TNOT CATEDOS Al STARTED © 47" OF A Examiner Analyst (N1)					NGLE	RI	EFERENCE C	AL. SHE	ET			SET-UP		
3 RATT 4 DUAL 0 DEGREE INDICATION INFORMATION IND METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE REMARKS NO CPACE SPL JNDS CATEDAS Al STARTON @ 47" OF A Examiner Analyst (M) Reviewer (N)			EE SHEAR											
ALSTARTED @ 47" OF A Examiner METHOD WELD DEPTH MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE														
REMARKS NO C PACK CS/LI TODS CATEDOS Al STARTED @ 47" OF A Examiner Analyst Lindication information MAX X1 LENGTH X2 Y1 WIDTH Y2 INDICATION TYPE INDICATION INFORMATION TYPE INDICATION INDICA												-		
REMARKS NO CRACK CERT SODE CATEDOS Al STARTED @ 47" OF A Examiner Analyst Length X2 Y1 WIDTH Y2 INDICATION TYPE Analyst Reviewer Reviewer Reviewer Reviewer Reviewer COI)	4	DUAL 0 DEC	SREE											
REMARKS NO CPACE CERT TOOS CATEDOS AI STARTED @ 47" OF A Examiner Analyst				·	IN	DICA	TION INFO	RMAT	ION					
REMARKS NO CRACK (SKIL TNO) CATEDOS AL STARTED @ 47" OF A Examiner Analyst (Reviewer Page Wischen Die IND	METHOD				X1	LENGTH	X2	Y1	WIDT	TH Y	/2		ON	
REMARKS NO CRACK (SKIL TNO) CATEDOS AL STARTED @ 47" OF A Examiner Analyst (Reviewer Page Wischen Die														
REMARKS NO CRACK (SKIL TNO) CATEDOS AL STARTED @ 47" OF A Examiner Analyst (Reviewer Page Wischen Die						<u> </u>	<u> </u>	<u> </u>						
REMARKS NO CRACK (SKIL TNO) CATEDOS AL STARTED @ 47" OF A Examiner Analyst (Reviewer Page Wischen Die ļ					<u> </u>		ļ							
REMARKS NO CRACK (SKIL TNO) CATEDOS AL STARTED @ 47" OF A Examiner Analyst (Reviewer Page Wischen Die								<u> </u>						
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen														
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen				•			<u> </u>	ļ	<u> </u>					
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen	ļ <u></u>	ļ						<u> </u>						
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen					<u> </u>									
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen			<u> </u>		1		ļ		>					
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen								ļ					1	
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen		ļ						ļ <u> </u>	<u> </u>		\rightarrow			
REMARKS NO CPACK (SKIL TODS CATEDOS AL STARTED @ 47" OF A Examiner Analyst Reviewer Page Wielle D. Merchen			<u> </u> _		<u> </u>			<u> </u>	<u> </u>				<u> </u>	
Al STARTED @ 47" OF A Examiner Analyst Reviewer Page Wiele Dille Will Dille Will Dille D						: :	<u> </u>		1	· .	<u> </u>			
Al STARTED @ 47" OF A Examiner Analyst Reviewer Page Wiele Dille Will Dille Will Dille D			L		<u> </u>		<u> </u>	<u> </u>				•		\geq
Examiner Analyst Reviewer Page Wesley De (N)			K (ZKI	<u>" Zwc</u>	ZCAT	ر محت	24							
Examiner Analyst Reviewer Page Wesley De (N)	AI	STAOTI	O @. u.	7" 06	A									
Wesler Wesler (NI)														
Wesler Wesler (NI)	Ęxa	miner		Ar	alyst			R	eview	ver			Page	
			2/10			<i>زى</i> لەر	(/el	1	_			[-5-	
			te 3/10/				5b103			Date_		_	of	

NO SEE ATTACAKO LISTIER FOOM J. B. ELDER

4/00	,		AUTO	AMC	TED ULT				NESS	 }			•		, ,, ,	
LOCATIO	ON	. 1		SYST	CALIBRA		HE	EI	CALIB	RATIO	N BLOCK				<u> </u>	
PROCE		TANK I	FARMI		AP-10	3			Ster	7 1	كاعطة	<u> </u>	<i>58</i>	<u>4-Ş</u>	79-30 MATERIA	
\mathbb{C}	ΞM	A - SV U	T- IN	<u>s -</u>	007.3	Lev	1 1			3"ີ	TO I	011			WATER S	
UT SYST	P-	4		SERI		209					E BLOCK				•	
P-Sco	ARE ا	VERSION SVS L	<u> </u>	3	REV. 2				THICK		N/4				MATERIA (U	Ä
LINEAR	TY D	41160	3						REFE	RENC	E BLOCK .		°F		PYRO SN	
I SCANNE	ER T	- Sd		SERI	AL#				COUP	LANT		******	•		BATCH#	
SCANNE	ER C	ABLE	<u> </u>						CABL	E LEN	GTH		CAB	LE#	N	
SIGNAL	CAB	COAY							CABL	SO SO	GTH		CAS	LE#	N/	
CHANN	EL	TRANSDUCE MAKE	ER	MO	DEL	FREQ.	Siz	ŽΕ	SERIA		GATE E		ANGI	LΕ	WEDGE TYPE	IMAGE
1		KB		M	SEB	5	81	2mm	019	38			Ø	3		13/
2																1/0
3		· · · · · · · · · · · · · · · · · · ·				<u> </u>							<u> </u>			
4						<u> </u>	<u> </u>		<u> </u>							<u> </u>
	ITIAI	CALIBRAT		<u> </u>							N CHEC					
DATE			1270		1/27/03	1/28/					9/03	1/29/	_	,	30/03	1/30/03
REFLE	FCT	OB	0720		2210	<u>0713</u>			25		150	27		3	730	1405
CH. 1		K.1	3"-1.		.3"-j.6"	.3"_1.	0"	.3"_/	0"		1-1.0°	-3-	1.0"	_		3"-1.0"
	TH	K. 2	.304	_	9901 dB	.304 .997/od					361	.999/1	18	-	301	.298 .993/odd
CH. 2	TH	K.1	.994/os		.295	.777/0 a .304	<i>D</i>	.996/ s			9/0ds_ 3c4	.30		744	9/00/B	.7740aa
	TH	K. 2	.997/0		990/JB	999/00	14		od 6	999		1.001		90	9/oda	99611da
CH. 3	TH	K,1	.304		.298	304	0	.30			1999.	30		1.1.1	364	.298
	TH	K. 2	999/00	4	993/008		12		odB		lod B	.004/1		00		ALIDA
CH. 4	TH	K.1	11111				· O		25-11		1000	1.0071	<u>~,,, , , , , , , , , , , , , , , , , , </u>	***	4000	11.07.1-10
	TH	K. 2														
FILE#	Ė										,					
EXAMIN	NER	•														
REM/	ARK	(S												·		
											_					
											_			_		
Exam	ine	1),	۸ :	E	xaminer	المحرين.	7		Re	viev	ver	12/	<u> </u>	1	Page	
$ \omega $	<u> </u>	Fund	4	6	Lleber,		4_	<u> </u>	4	<u> </u>	gley l	بسكاركا	<u>u_</u>	<u>-</u>		_ of
Level				3 L	evel	Date_ <u></u>	بعل	03	Le	veh	∕ S Da	te <u> 5/</u>	2,/U	ر کا		
Psc.	Ci	Limite	₩.	- 1					i							

4/00		ΔΙΙΤ	ΛMΔ	TED ULT	DASON	IC TUICE	NECC	<u></u>			.	*	
L				CALIBRA	TIONS						2	ob # o	3-41
LOCATION 200 FAS	T TANK	FAOM	SYST	EMAP-10	\ \ ₹		Ster	RATIC	N BLOCK	,		99-30-	
PROCEDU	NA - SVU	T_ T 1		ΛΛ ⁻ - 2	بہ 0		Ster	NESS	X () ()			MATERIAL.	17-
UT SYSTE	M	<u> </u>	SERL	AL#	Rev	1	REFER	RENCI	<u>FO I.</u> Eblocki	011	·····	। US	•
PSP	E VERSION			206/1	209		THICK	NECC	<u> </u>	A		MATERIAL	
P-Scar	2V2 c	1 1	3	<u>""2</u>			l		N/A			NA	
LINEARITY	DUE DATE 4	3					REFER	RENC			ò.F	PYROSN.	
SCANNER	TYPE S-Sd		SERI	AL#			COUP	LANT	-			BATCH#.	
SCANNER	CABLE	l					CABLE	LEN	<u>gŢ</u> H	· · · · · · · · · · · · · · · · · · ·	CABLE #	l N/A	
SIGNAL CA	COAS					····	CABLE	LEN	GTH		CABLE t	NA	
CHANNEL	COAY		MOD	\ <u>C</u> I	FREQ.	SIZE	SERIA	<u>80</u>	GATE E	/A1 1	ANGLE	ν/Δ WEDGE	IMAGE
	MAKE	EN			MHZ	SIZE	SERIA	L #	METHO		ANGLE	TYPE	U
1	\bot K B		U	ISEB	5	8x2mm	019:	38			φ		(4/
3	<u> </u>				ļ								N/N
4				· · · · · · · · · · · · · · · · · · ·			 			1		}	100
	I IAL CALIBRA	TION	<u>' </u>		<u></u>	C	ALIBRA	ATIO	N CHEC	KS.		<u>!</u>	
DATE		2/4/0	3	2/4/03	2/5/0				5/03	3/5/	03		
TIME	STOD	015	0	1400	<u>ن 5</u>	190	5		350	193			
REFLEC	THK.1	.3"-1.	~	<u>,3"-1.6"</u>	.3 '-1.0	· · · · · · · · · · · · · · · · · · ·			-1,0"	.3°-			
	THK. 2	.304 .999/o		.367 999/cdB	.301 .999 pd	30 8 .999/1			10dB	1.002/			
	THK.1	.30		.307	.301	.30			04	.36			
L	THK. 2 THK. 1	1999/0		1.004/ Id8	999 09				ods	1.004			
00	THK. 2	.304 999/00		.307 1.001 IdB	36/	.30 8 .999 l			30/ 1/0dB	30	7 1d6		
CH. 4	THK.1	171/00	P	I.WY IAB	999/00	<u> </u>	-Idb	.377	I Dab	1.004	190		
	THK. 2												
FILE #		ļ		····									
REMAF	· ·	<u> </u>						<u> </u>	····		l		
<u> </u>			-										
							-				· · · · · · · · · · · · · · · · · · ·		
									_				
Examin	er C	N .	ΙĖ	xaminer			Re	view	ıer .		·	Page	
12	DHW	<u> 446</u>	. _	- Author			14	les	and	9Z/2	4		of
Level 1	Date 2/4	-5 03 315 0		evel	Date		Lev	vel 3	M Da	te <u></u> 5):	21/03		
Y-X4) Limited	-101-	-1									1	

4/00				ΔΗΤ	OMA	TED ULT	PASON	IIC THICI	CNEC	<u> </u>	·	- ·	•	,	······	
				701	Ollin	CALIBRA			VIACO	3			:	20P 큐	63-4	11
LOCATION 200 EAS	N ST	TAN	k I	FARM	SYS	FEM AP-10	 ソマ		CALI	BRATIC	N BLOCK			-99-30		
PROCEDI	JRE	:			1<	007.3	Rei	1 1	THIC	KNESS		*	<u>, , , , , , , , , , , , , , , , , , , </u>	MATER	AL,	٠.
UT SYSTE	M		<u>v u</u>	, 1	SER	IAL#		<u>/</u>	REF	3 RENC	E BLOCK	.011		1 4	<u> </u>	
_SOFTWAF					<u> </u>	206 1 REV.	209		THIC	KNESS	<u> </u>	A		MATER	AI	
P-Scar	w.	SVS	١ ١	1	<u>E, </u>	75					N/A	·			I/A	
LINEARIT	ΥU	4116	10	3					REF	RENC	E BLOCK		o F	PYROS	IA	
SCANNER	STI STI	_{ԴЕ} ,	7		SER	IAL#			cou	PLANT				BATCH		
SCANNER	ì C	E O		······					CABI	E LEN	<u>eth</u>		CABLE	= #	ija .	
SIGNAL C	AB	.E.			<u> </u>				CABI	ELEN	<u>GTH</u>		CABLE	- 4	•	
CHANNE	<u>-</u> -1	TRANS		ER	I MO	DEL	I FREQ.	SIZE	SERI	<u>80</u>	FT GATE E	VA!	ANGLE		/ <mark>/</mark> 4	<u></u>
		MAKE					WHZ		OLIV.		METHO			TYPE	∀	,
1 2.	_		B			SEB	5_	2x2mm	019		<u> </u>		ø		13	
3		<u></u>	B		1 m	SEB	15	BX2M M	019	137	ļ		Ø			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
4	-		· · ·		+-	····	- 		+						/ <u>1</u>	1/4
INIT	ΊΑΙ	CALIB	RAT	ION	1		<u> </u>	1	CALIBR	ATIO	N CHEC	KS.	L	<u> </u>		ب
DATE				2/4/	3	2/6/03	26/03	2/10	03	2/1	9/03	2/19/	03	2/19/03	2/19	03
TIME	~~	00		075		0755	1330				<u>8/0</u>	08/	0	1950	195	
CH. 1		K.1	· · · · ·	.3"-/		3"-1.8"	.3"-10		1.0"		"-1. D"	.3"-4		,3"-1.0°		-
I , F		K. 2		.999/0		.999/od6	.295 993/10	18 996			301 11008	-30 999/		.292. 987/ idi	.291 1.996	
CH. 2	ТН	K.1		. 117/0		.30/	275	29			17 <i>000</i> 304	30		292	30	
	TH	K. 2	-	991/0		.999/ods	993/10		28		loda	999/		990/2de		
CH. 3	ŤΗ	K,1		.30		.30/	.295	.3		$\overline{}$	gusan Roj	.30		.292	. 298	
	TH	K. 2		999/		999lodB			2 dB		Jode	999		990/2de		
1	TH										7			,		
	TH	K. 2														
FILE#										<u> </u>						
EXAMINE										<u> </u>		<u> </u>				
REMAI	RK	KS		<u></u>							·	· 				
								·								
								 -	·		·	· ·				
	$\overline{}$										_					
Examir	Tei	77	.1		E	xaminer				eviev		M	7	Page		
Level	7	<u>myd</u>	u Tor	- ماصل	- -	_evel	Date		1/-		WY DE		21/10=	; -	of _	-
5.500					- '	-0461	- Date		"		TADO	110 3/6	<u> </u>	'		

4/00				AUTO	OMA	TED ULT	RASON	1IC	THICK	NES	s			•				
						CALIBRA									2۲	b # d	<u>عد</u> د	41
LOCATIO 200EA		TAN	2	FARM	SYST	EMAP-10	_ \द			CALIE	RATIO	N BLOCK		て名し	1.9	79-30	I L	14
PROCED COX-E	URI M	A - SV			<u> </u>	007.3	Rei	<i>)</i> 1		THIC	<u>iness</u>		.011	<u>~~</u>	٦	MATERIA C./S	L	<u> </u>
UT SYST	₽ _	4			SER	AL#	209			REFE	RENC	E BLOCK				——·		
SOFTWA	RE I	ERSION	4	1 1,	3	REV. 2				THIC	(NESS					MATERIA		
LINEARIT	TY D	UE DATE		3						REFE	RENC	E BLOCK) F		PYRO SN		
SCANNE	R TY	- Sd	<u>بد ا</u> ا		SER	AL#				COUF	PLANT		יייי	· · · · · ·	7	BATCH#	•	
SCANNE	R C	00£		······································						CABL	E LEN	GŢН	· · · · · · · · · · · · · · · · · · ·	CABL	E#	N N		
SIGNAL (ÇAB	E.								CABL	ELEN	<u>ਰ</u> ੂਜ		CABL	E#	<u>ام</u> إلا .		
CHANNE	<u>.</u>	TRANSD	UČE	ER	MO	DEL	FREO.	Ţs	IZE	SERIA	<u>200</u> AL#	GATE E		ANGL	E	WEDGE	IN	IAGE
1		MAKE	<u> </u>	· · · · · ·	MC	SEB	MH2 5	-	(2.M M	O19:	» (L	METHO	D	Ø		TYPE		₽ 1
2		K(SEB	5		(2/11 M (2/11 M	019				ø			+	2/10
3																		N.
4																	V	ZF
	TIA	. CALIBR	RAT		L							N CHEC		·				,
DATE				2/2da	3	2/20/03	2/20/0		2/20			25/03	2/25			25/03		5/03
REFLE	CT	∩R		<u>0755</u>	11	0755 .3"-1.0"	3'-1.0		143			740 '-1.0"	31-1			<u> 345</u> ''-1.0"		45" -1,0"
CH. 1		K.1		301).		289		.29	_	_		·		<u>, I</u>			- <i>1,0</i> 95
	TH	K. 2		,999/00	10	.301 .999/ads	987/2	-	987			Ol Node	939/		 ص	298 6/2d8		ig B
CH. 2	TH	K.1	-	.30 I	15	.301	289	40	, 29		1	1/ <i>048</i> 104	304			61 2018 298	,	198 98
	TH	K. 2		.399 l e	14	.301 9991 ad B	990/2	14	990/-		7	10ds	,999/			dzdB		10 11ds
CH. 3	TH	K.1	_	.301	<u> </u>	. 30l	.289		.29			11 000 301	30			4 ZAB 298	_	78
	TH	K. 2	_	999/00	ما	.991/od &	990/20		.990/-			ode	.999/			210 112d8		IdB
CH. 4	ŤН	K,1		333/6-		· Ci yee	10000		11.54		1177	1000	133743	266		11 TOR	 	
	TH	K. 2						. 4	 		1						\vdash	
FILE#													ļ			:-	-	
EXAMIN	ER								1									-
REMA	RK	S		<u>-</u>							•		· · · · · ·				·	
		•																
												· · ·	,					
		 				*							·		-			
																		- 1
Exami	TE				TE	xaminer				Re	viev	ver_			7	Page		
MD	\mathcal{H}	udu			. _							lest	7. las		_	-	_ of	
Level ;	1	Date	2/3	0425/0	3 L	.evel	Date			Le	vef	Da Da	ite_ ;	<u> </u>	3			
		Limit	· 4		- 1					- 1			-		- 1			

4/00		ALITA		TED ULT	BASON	IC TUICE	ALCC	- · · · · · · · · · · · · · · · · · · ·		{	
j .				CALIBRA	TIONS		MESS		2	0b # 0:	a-41
LOCATION 200 FAS	T TANK I	FAOM	SYST	EMAP-10	رج ·		CALIBRAT	ION BLOCK		79-30 <i>-</i>	
PROCEDU		T- TA)	<u> </u>	7073	Rev	7 1	THICKNES	S	<u></u>	MATERIAL	172
UT SYSTEM PSP	W	1 2510	SER	IAL#		1	REFEREN	CE BLOCK		US	
SOFTWAR	E VERSION	·		I REV.	209		THICKNES	N/A		MATERIAL	·
P-Scan	E VERSION SYS DUE DATE	1.	3	2			DESCREAM	AJ/A CE BLOCK TEMP		NA	
	4/16/0	3		<u>:</u> -				Amb	oF	PYROSKI. N/A	
SCANNER	JANE 29		SER	IAL#			COUPLAN	T		BATCH#	
SCANNER	CABLE	,					CABLE LE	NGTH	CABLE #		
SIGNAL CA	COAY	<u>-</u>					CABLE LE	NGTH	CABLE #		
CHANNEL	TRANSDUCE	<u>=</u>	Гмос	DFI	FREQ.	I SIZE	SERIAL#	GATE EVAL	ANGLE	ν/Δ WEDGE	IMAGE
	MAKE		<u></u>		MHZ	0	QEAUNE #	METHOD		TYPE	ש
1 2	KB	L	III	SEB	5	812nm	01935		10		3/
$\frac{2}{3}$	-		ļ		 		ļ	 			N. S.
4	-}	***			 	<u> </u>	· · · · · ·		1		3/4
INITI	AL CALIBRAT	ION	\top				ALIBRATIO	ON CHECKS	.l. ,	<u></u>	<u> </u>
DATE		4220	3_	4 22 03	4/29/	3 429	03				
TIME		0810		1600	حارة	159					
REFLEC	HK.1	3"-1.0	<u>)"</u>	.3-1.0"	.3-1,0	3"-	.0"				
l • ' ' L L	HK. 2	301	1.0	310	.304						
1 1	HK1	999/00		1.002/1018	.999/00	1	id6				
• .	HK. 2	.30		.307	.304	.3/4					
L `	HK.1	.999/0		1.004 ad8	_						
1 7.77	HK. 2	301		.307	304	36					
[] '	HK.1	.999/0	<u> </u>	1.004 ids	.494/0a	6 1.004	1018				
• · · · · L	THK. 2					 					
FILE#											
EXAMINE	R ·										
REMAR	KS			·							
								,			
					<u>.</u>				·	~ 	
Examin	17.71	•	. E	Examiner			Revie	wer Lust X	1.	Page	of .
<u> </u>	L Date 12	2429 11	<u>.</u> -	.evel	Date			vv Date 5	101/02	-	· —
PSC			" "	· · · · · · · · · · · · · · · · · · ·		,	20.01				

4/00		AU		MATED UI CALIBRA				· ·				Z0P#	03-41		
200E A	NAT TANK	FARM	SYS1	EM AP-1	13		CALIE	M	NBLOCK	~k	G	584-99	30-14/		
	MA-SVI		20	- 007		l vs	THICK	NESS	'V''	· ·		MATERIA	Ĺ		
TESS!	EM .	<u> </u>	SER	IAL# 201-	1209	CYL	REFER		F BLOCK	υ/ 4		4	<u>></u>		
SOFTWA	ARE VERSION			REV.	1204		THICK	NESS	;		······	MATERIA	الم		
LINEARI	N SYS L		3	1 2	· · · · · · · · · · · · · · · · · · ·		REFER	RENC	د/ در E BLOCK I			PYRO SN	(.		
SCANNE	-4/16/0	3	SER	IAL#;		.	COUP	LANT	<u> </u>	mb	of.	BATCH#	JA .		
AW	S-5d R CABLE O						CABLE		<u> </u>	6	I CABI	٨	I/A		
		AX						8	OFT			٨	PIA		
SIGNAL															
CHANNE	CHANNEL TRANSDUCER MODEL FREQ. SIZE SERIAL # GATE EVAL ANGLE WEDGE IMAGE MAKE METHOD NOM/ACT. TYPE														
	KB		r	NINB	4	8x9mm	302	ų	INC ITIO		45				
2	KB	····		MWB	4	BX9MM	312	1			45	,	385		
3			ļ				<u> </u>		L				The Man		
11	<u> </u>	ATION		<u> </u>		<u> </u>	L CALISI	RATI	ON CHE	CKS			<u> </u>		
DATE		ווצרו	<u> </u>	1/27/03	1/28/0				903	1/29		1/30/03	13003		
TIME	CTOR /	0750		2715	0725			_	155	22.	50	0745	كاما ا		
ł .	NTATION	Notch		1050"	Notch	ع. ٥٠ اعاده نير		NO.	50" tch	Note		1050 "	votch		
CH. 1	AMPLITUDE			80%/160	000 00				dade	80%		80% od8	Bold ids		
CH, 2	LOCATION AMPLITUDE	1.414		1,411	1.414	1.40	8		44	14		1.414	1,414		
Cri. 2	LOCATION	1.414		8090/2 de	80% pc				414	80%		1.414 8084048	1.414		
СН. 3	AMPLITUDE	1.37	1	1.711	1.717	1.4		. 1.	7/-7	117/	1		-11314-		
	LOCATION														
CH. 4	LOCATION	 								ļ					
FILE #		 				_				-					
EXAMI															
REMA	RKS	•		•											
		·				·.									
Exami	(Tex	-	E	xaminer		· · · · · · · · · · · · · · · · · · ·	Re	viev	/er			Page			
ωz	show 1c				D-1		14	20	Pent			_	- 6		
Level	T Date	7-30/03	╏┖	.evel	Date		Le	/el_	Da Da	te_ 5/ 2	<i>1/03</i>	- -	_ of		

4/00														<u> </u>	<u> </u>	
			AU	TO	MATED UL CALIBRA				MAC						•	
					ONLIBIO	IION	J	neel						7	06# (73-U1
LOCAT	ЮŃ		~	SYS	TEM AC .			·····	CALI	RATI	ON BLOCK					
200E	ULIB HZ	<u>r Tank</u>	FARM		II-9A	3				MICCO	,	كحلا		<u>5€</u>	MATERIAL	30-146
LOG	ĔΝ	JA-SVU	IT- IC	20	- 007.	3	R	1 49	,		" ס.ו				US	
TSYS PS F	JEM	1	. 1	SER	IAL# 206	120	Q		REFE	RENC	E BLOCK	U/ 4				
SOFTW	ARE	VERSION			REV	1.00			THIC	KNESS	3			-	MATERIAL NA	
LINEAR	<u>いい</u> コソロ	SVS U		3	2				REFE	RENC	E BLOCK			_	PYRO SN.	4
		VIE DATE	3						L		£	mL	o F		7)	A
SCANN)s	-5d		SER	IAL#;				COUF	LANT	Ha	'ه	•	٠	BATCH#	e i
SCANN	ER C	きないた	ΑX						CABL	E LEN	GTH 30 F T		CAS	LE#		
SIGNAL	CAE	1 F						 -	CABL	E LEN	GTH 30 FT		CAB	LE#		
CHANN	151	C O		MO	OEL	FREC	1	SIZE	.SERIA		GATE E	VAI I	ANGLE		WEDGE	IMAGE
		MAKE			·	mн		0.22		·	METHO		NOMA	ĊT.	TYPE	H
1 2		KB		_	WB	4	_	BK9mm	302	4			45			
3		KB			MB	<u> </u>		BYPAM	313	7	· ·		45		<u> </u>	XX
4						 									ļ	16/
<u> </u>	NITI	AL CALIBRA	ATION		l	<u></u>			CALIB	RATI	ON CHE	CK.			L	NA 1
DATE			2410	1 ·	2/4/03	2/5/	6:				6/03		5/03		1	
TIME			080	0	1415	080	5	1915			35		40			
		OR / ATION	050		,050"	: 050			5′′		50"		56"			
CH. 1		IPLITUDE	Notel		notch Botolida	Note		Not ch	 		Ach Mode		tch Polode	\vdash		
l	1	CATION	1.414		1.414	<u>00.70</u> 1.41		1.41			<u>190008</u> .444		<u> 414</u>	<u> </u>		
CH. 2		PLITUDE			20%/-2ds					_	%/ods	Bo	V-1d6	_		
		CATION	1.414		1.414	1.41		1.41			,44		414			
CH, 3	┺-	IPLITUOE													<u> </u>	
CH. 4	1	CATION	<u> </u>							<u> </u>		<u> </u>		_		
011.7		CATION														
FILE:	#	'	 			 -							· · ·			
EXAM			· · · · · ·		<u> </u>									Т	1	
REMA	ARK	S														
		· · · · · · · · · · · · · · · · · · ·		-	·····			·								
			.		·····	·		-:							_	
															1	
Exam	ine)		E	xaminer					view		12	1		Page	
Level		Dave 214	45/12	7	evel [Date					Level VMOa			<u>.</u>		of
		inded 3				-aic			126	· U1 _	Lypua	112_5	(aciil)	•		, •••,

4/00			UA	TON	MATED UL	TRASO	NIC P-SC	CAN	•			
		·			CALIBRA	TION S	HEET),	·	
LOCATI	<u> </u>			SYST	211			CALIEDAS	HOM BLOOK		<u>79₽#</u>	03-41
200E	7 Z A	TANK	FARM		A₽-10	3.		Note	ION BLOCK	ξ _ 5	684-99	-30-146
PROCE		10-501	T T	211	- 007.	2 0	evl	THICKNES	" J. D		MATERIA	ίĽ I
TIT SAS		<u> </u>	11- 1	SER	Δ1 #	1	EV_I	REFEREN	CE BLOCK .		-143	2
115.	ᆚᄔ	VERSION			206 1857	209		THICKNES	NA		L MATERIA	<u> </u>
Pisco	(A:	U ZVZ	1.3	3	REV.			INIONNE	A/4		MATERIA N	Ά
LINEAR	ITY C	UE DATE	2					REFEREN	CE BLOCK TEMP	05	PYRO SI) IA
SCANN	er t	ÝΡΈ	,	SER	IAL#;		····	COUPLAN	T	3	BATCH #	
SCANN	<u>)S</u>	<u>- 5</u> d	1					CABLE LE	H2°	CABL	C # /	ŊΑ
[<u> </u>	A V.					1 (Boff			U/A
SIGNAL	CAB	1 F	AX					CADICIC	NGTH BOFT	CASL	.E#	JA .
CHANN	EL	TRANSDUC MAKE		MO	DEL	FREQ.	SIZE	.SERIAL#	GATE EVAL METHOD	ANGLE NOMJAC	WEDGE T. TYPE	IMAGE
1		KR		N	WB.	4	BYGRM	3024		45		\ \\\
2		KB			nub	4	81944	3137	,	45	<u> </u>	, XR
3								<u> </u>		ļ		Light Time
4						1		<u> </u>		<u> </u>		<u> Vä</u>
		AL CALIBR.			· · ·				TION CHECKS			, '
DATE	_		3/15/0	<u>3</u> ·	3/10/03	3/11/0						 -
REFLI		OR /	.050	Ħ	.050	.0504		<u>., </u>				
		ATION	Notch		Notch	Notch	Note	Ĭ.				
CH. 1	1	IPLITUDE		S	8070/-101							
	1	CATION	1.414		1.400	1.414	1.41					
CH. 2		IPLITUDE CATION				20%/00						
CH. 3	1	PLITUDE	1,414	/ -	1.424	1.414	1.41	4				
Cn. 3		CATION	ļ									
CH. 4	1	IPLITUDE	 			-						
	1	CATION	 		<u></u>							+
FILE	#				-							
EXAM		₹	<u> </u>		,							
REMA	ARI	(S										
									·			
							 		·			
											,	
Exam			74	E	xaminer			Revie	ewer		Page	:
Level	1	Date3/1	+11 /03	` ī	.evel	Date		Level	Date_	· .	- -	_ of

4/00		AL	ITO	MATED UL			CAN					
	· i			CALIBRA	TION S	HEET				Ļ.	de.	
LOCATION	N	~ 1	SYS	TEM 40			CALIBRAT	ION BLOCK	-	170	<i>2P</i> # €	3-41
1200E A	ST TANK	HARM		- A⊬-10	3.		NOTC	ION BLOCK	<u> </u>	<u>58</u>	4-99-3	0-146
COGE	MA-SVL	IT- I	NS	- 007.	3 R	l vs	THICKNES	1.0"		.	MATERIAL	
TISYSTE	ĒΜ	_	SER	TAT M	1209		REFEREN	CE BLOCK N/A				
-SOFTWAR	RE VERSION			L REV	1607		THICKNES	S			MATERIAL N A	
LINFARIT	O SVS U		3	2		· ·	REFEREN	N/A CE BLOCK TEMP			PYRO SN.	<u> </u>
	Y DUE DATE 4/16/0	3	122					Aml	> °F		N)	9
SCANNER	5-5d		SER	IAL#;			COUPLAN	T H2°	•	٠	BATCH#	a
SCANNER	CABLE ()	AX					CABLE LE	NGTH BOFT	CAE	SLE#	N)	
SIGNAL C	ARIF	AX		 ·			CARLETE	NGTH PO F T	CAE	3LE#	<u>ا</u> لم	
CHANNE			MO	OEL	FREQ.	SIZE	.SERIAL#	GATE EVAL	ANGLE		WEDGE	IMAGE
1	KB		0	NWB	MH2	MARKS	3140	METHOD	NOMJA 45		TYPE	4
2	KB			NWB	u	BYRNA	3141	 	45			Z, Ñ
3								'				√Q/m
4	1			· · · · · · · · · · · · · · · · · · ·								\d
	TIAL CALIBR	 		<u> </u>			CALIBRAT	ION CHECKS				
DATE		430		1215								
REFLEC	TOR /	07/5		1215				<u>-</u>		-		
	NOITATI	Noteh		Notch	•							
	AMPLITUDE	20%/o		200/1.5d6						-		
	LOCATION	1.41		1.421						-		
CH, 2	AMPLITUDE			80211818						1-	-	
	LOCATION	1.414		1407								.,,
CH. 3	AMPLITUDE	1		77.2								
	LOCATION											
	AMPLITUDE											
	LOCATION									L_{-}		
FILE#												
EXAMIN				ll				<u> </u>		L_		
REMAR	KKS											
	,					· · · · · · · · · · · · · · · · · · ·						
				·····		- :,						
				********				•			,	
Examin	er AT	2,_	E	xaminer			Revie	wer			Page	
Level		30/03	Ī	.evelC	Date		Level	Date		-		of <u>·</u>

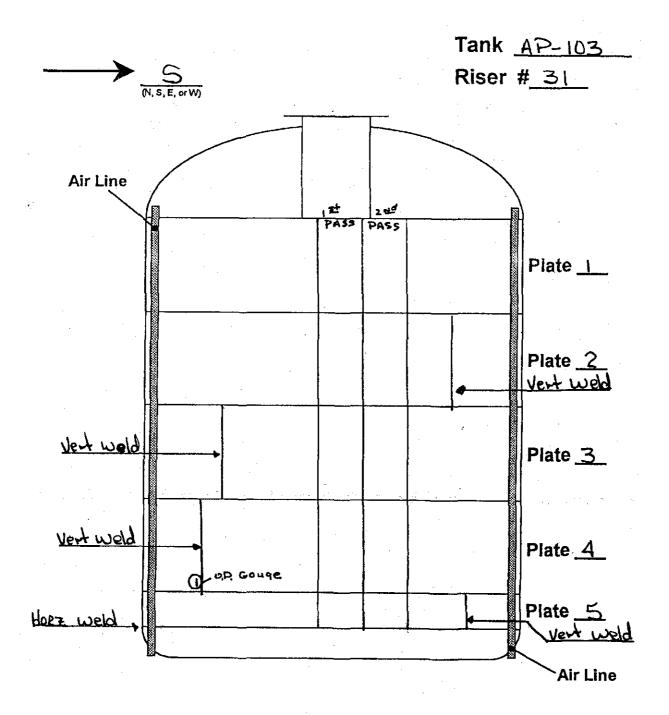
4/00	AUTOMATED ULTRASONIC P-SCAN															
}		CALIBRA						 	s) at	.	. 1 1					
LOCATI	ON TANK	F-0.0-	SYST	EM AP-11			·	CALIE	RAT(C	N BLOCK	·			7P#		
PROCE!	<u>AST TANK</u> EMBA-SVL	THICKNESS					<u>58</u>	4-99-		46						
TIT SYS	TEM	REFERENCE BLOCK														
1151	ARE VERSION	1 REV.	THICKNESS NATERIAL													
1.200	12 SVS U			<i>ν/ι</i>		·····	NA									
	TY DUE DATE.	3	·	REFE	RENC	BFOCK.	MP	٥F	PYROSN.							
SCANNE AW	RTYPE S-5d	İ	SER	IAL#;				COUP	LANT	Ha	, 6	`.		BATCH#	IA	
SCANNE	R CARLE .	AX			******			CABLE LENGTH CABLE								
SIGNAL	CABLE	AX			 -			CABLE LENGTH CA					SLE # N/A			
CHANN	EL TRANSOUC		MO	DEL	FREQ.		IZE	.SERIA		GATE E	VAL	ANGLE		WEDGE	IMA	
1	MAKE KB			NWR	m Hz	_	O	313	_	METHO)	NOMJAC		TYPE	7 2	;
2	KB			NWB	1 4		MMP.	312			-	<u> 45</u>			1/3	70
3	3 RB		1	MWB	ч		MMP	3024			цe				1	\ N ∏
4	NITIAL CALIBR	ATION		MMB	4	8	MMM	3/2		ON CHE	OKC	45	5		<u> </u>	
DATE		2/24	٦.	2/26/03	33/0	3	3/3/0		3/4		3/4	loz	3/	003	3/0	63
TIME		10915		305	09/	٥	201			7.30	14	30_		840	134	5
1	ECTOR / ENTATION	,050 Notch	•"	Notch	Notel		,050 Note			50" Heh	,0:	tch	_	⊅ 5 Α″	Note	
CH. 1	AMPLITUDE	80% 00	15	Bodd ido			80%/1			Ode				otch Wode	30%	
27.2	LOCATION	1.414		1.414	1,414	Ł	1.41	/		414	1.4	14		414	1.42	<u> </u>
CH, 2	LOCATION	80% o	216	80% 1 ds	2090/ c		80%/			oloda V		ods		Mods	8074-i	
СН. 3	AMPLITUDE	80%/00	lB	80%/226			80%/0			414 0 0 0 0 0	8099			414 70/0015		
CH. 4	LOCATION	1.414]	1.411	1.414	ŧ	1.41	4	1.4	#14	1.4	11	1	.414	1,43	2/_
Cri. 4	LOCATION	3070/6	48	80%/-1d8	3076/2 1,414		1.411			o/odb Hu	20%		100	10/006 .414	8090/1	
FILE #	#	1.117			_11-71-	7	1.411			0. 4	1.3	.7	_	.4.7		7
EXAM!		10m	>	4gw	$\omega_{\mathcal{D}}$	P	<u>aul</u>	<u>D</u>	يبر	PB	<u> w)</u>	90	w	HN	W#	<u>₩.</u>
KENIA	ARNO															
																_
											• •			,		-
Exami				xaminer	. ^-		,		view		11-	~		Page		\neg
	Level II Date 2121-3/4/03 Level III Date 3/10/03 Level III Date 5/10/03 of															
	w Limited		"		<u>_</u>	114	M	-	· ~, 7	ەت سى	, <u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	· 1234	~>		'	-

4/00			AU	TO	MATED U				CAN	<u> </u>							
			CALIBRA	٠					ļ.,	, -1	50 (1)						
LOCATI	ION		~ .	SYS	TEM 40	CALIBRATION BLOCK J											
PROCE		TANK	AP-I	NOICH 1310CK 584-99-30-1													
L'OC	FIX	A-SVL	- 007	1.0"													
#ISYS	ZEM L	4	11AL# 206	REFERENCE BLOCK													
SOFTWARE VERSION REV. 2											THICKNESS MATERIAL						
LINEARITY DUE DATE											E BLOCK	TEMP			PYRO SN.		
SCANN	ER T	#160:	<u> </u>	SER	IIAL共;				COUP	LANT		mb	of .	_	BATCH#	<u>IA</u>	
SCANN	<u>so</u> c	- <u>5</u> d		,					CABL	Clevi	<u>. Ha</u>	6	1 642	154	N	IA	
[<u>('0</u>	AX						i	2	OFT			ASLE# NA			
SIGNAL	. CAB	୮ ୯୦	AX						CABL	E LEN	GTH SOFT		CAS	LE#	Ņ	IA	
CHANN	IEL	TRANSDUC MAKE	ER	МО	DEL ,	FREQ.	Siz	ZΕ	.SERIA		GATE E		ANGLE NOM/A	CT	WEDGE TYPE	IMAGE	
1		KB		n	าพห	U	_	mm	310		WEIRO		مريبرير عام		TIFE	4	
2		KR	5,		nwB	4		mm	311			-	60			N. C.	
3	<u></u>	····								<u> </u>					·	m of	
4	NUT	AL CALIBR	ATION	<u>L</u>			1		CALIC	DATI	ON CHE	CIVO				NA)	
DATE		AL CALIBA	2/40	3	2/6/03	2/19/0	2	2/19			00 Che 2903	2/2	0/02	2	25/03	2/25/03	
TIME			US/5		1340	082	0	20		0810 141		7-	1	755	1345		
REFLI			,050 Note:		, 050"	,050	"	. 650			50"	Ι .	5 0"	ŀ	50"	.050"	
CH. 1		PLITUDE	20000		80%/1dA	Noteh 802010	علما	Not 4		805	blodA	40	oloda	_	otch 7doda	Notch 302dids	
		CATION	1.99	<u> </u>	1,999	1,999		2,00			, -	1.999			919	1.998	
CH. 2		PLITUDE CATION	80%/0		80% Idb		16	80%/			0/0dB		of ode	7		30%/10/A	
CH. 3		PLITUDE	1.99	7	/.9 19	1.977		1.98	37 /.999		1.995		-	999	2.007		
	L	CATION															
CH. 4	<u> </u>	PLITUDE				·										*.	
FILE	1					ļ	-	·	· · · ·	 		 		-		- N	
EXAM			<u> </u>							_					<u> </u>		
REMA	٩Rĸ	S				<u> </u>	· <u></u> -			1 				-			
	-				·				····								
					· · · · · · · · · · · · · · · · · · ·		· .										
<u></u>			····						1.6	·					<u> </u>		
Exam	/t iusi	Budd			xaminer			٠		view		47	ر ده 7		Page	·	
Level	立	Date 24	-25/03	์ เ	.evel	Date					vy Da	te	1211	Δ3I		_ of	
PScan	. 1:	unted.	•	- [1				-			İ	

4/00			AU	TO	MATED UL			CAN						
					CALIBRA	TION S	HEET				-	· ^} 4}_	ווו כא	
LOCAT	ION	c Tank	6004	SYS	N-9A MAI	CALIBRATION BLOCK 100 to 1 to 1 to 1 to 1 to 1 to 1 to 1								
APROCE	DUR	r Tank TA-svi	. FAKII		MP-10	THICKNE	SS	20	NATERIAL					
TITSAS		1H-SVL	<u> 11- 10</u>	<u>2 V</u>	141 #	REFERENCE BLOCK								
IPSI	ا بيد	4			206	N/A								
P.S.c.	iare 3N	VERSION SYS U	تعاليا	3	REV.	THICKNE	SSP/A		ļ	MATERIAL				
LINEAR	RITY C	UE DATE	2			REFERE	NCE BLOCK TEMP			PYRO SN.				
SCANN	ER T	- 5d	_	SER	IAL#;		COUPLA	H2°			BATCH#			
SCANN	ERC	ADLE					· · · · · · · · · · · · · · · · · · ·	CABLE L	MOTH	CAS	LE#	N/A		
SIGNAL	CAS	LE .	AX					1 CADICIO	80FT	CAE	N/A			
CHANN		C O	AX	· Luc	DEL	FREQ.	SIZE	.SERIAL#	&°±₁			N WEDGE	A IMAGE	
	45L	MAKE		MIO	DEL ,	MHZ	SIZE	.SERIAL #	METHOD	ANGLE NOM/A	CT.	TYPE	MAGE	
1 2		Κ̈́B			JMB	<u> </u>	2X9mm	3111	<u> </u>	اود	_			
3		<u> </u>	3,	mws		4	MM PIG	3107	*	60			X E	
4								 	 	 			18	
		AL CALIBR	ATION	·		<u></u>		CALIBRA	TION CHECKS	<u> </u>			<u> </u>	
DATE			4/24/		4/24/03									
REFL		OR /	085		,0504							<u> </u>		
ORRI	ENT	ATION	Notch		Notch	,					L			
CH, 1	1	CATION	3090/0		8090/0016									
CH. 2		PLITUDE	80%/0		1.999 80% llds						_			
		CATION	1,99		1,999						-			
Сн. 3		PLITUDE												
CH. 4	1	CATION IPLITUDE	 								_			
	L	CATION	 								-			
FILE														
REMA			<u> L</u>		<u> </u>						L_			
I IVEIV	יוצנר													
							<i>'</i> .					<u> </u>	[
Exam	ine	<u> </u>		E	xaminer			Revie		~		Page		
mi	$\overrightarrow{7}\overrightarrow{p}$	udy.	- د الدها	1	ovol 5	1010		41	des H	lu-	_		of .	
P.S.	<u>میشند.</u> ایرین	Limite	124/03	` '	.evel [7dl6		Leve	VV Date_	5/41	کد		. of	

4/00		UA	IOT	MATED UL CALIBRA			CAN		7	0b# 6	53-41	
LOCATION 200E AS	T TANK	Egom	SYS1	IEM AP-10	CALIBRATION BLOCK NOTCH Block 584-99-30-146							
PROCEDUR	ก็A-suu	17 7	216	- 007.	THICKNESS MATERIAL							
LUI SYSTEM	1.	1111		1A1 #	REFERENCE BLOCK							
SOFTWARE	<u> </u>			" 206 REV. 2	N/A							
LINEARITY	SVS 4	تعلب	3	1 2		P/A		MATERIAL				
L	<u>411603</u>	3			·		Aml	°F	PYRO SN.	4		
SCANNER 1	-5d		SER	IAL#;			COUPLAN	H25	`	BATCH#	4 _ J	
SCANNER (P # O1 C"	AX					CABLE LE		CABLE #	N/A		
SIGNAL CA	BLE .			·			CABLE LE	WGTH T	CASLE #			
CHANNEL	COAX NEL TRANSOUCER MAKE			DEL	FREQ.	SIZE	.SERIAL#	GATE EVAL METHOD	ANGLE NOMJACT.	WEDGE TYPE	IMAGE	
1 2	<u> KB</u>			JMB	4	EIGMM	3110		00			
3	KB	د	1	NN B	4	\$19 MM	3112	-	60		X N	
4	 			·····	<u> </u>			 			19	
	IAL CALIBR	ATION	L			L	CALIBRAT	ION CHECKS				
DATE		4/30										
TIME REFLEC	TOR /	1270		1415			 	···			 	
ORRIEN		اماء		Notch	•		.]		1			
	MPLITUDE .	80%	dA	20/0/248								
LI	OCATION MPLITUDE	2.00		2.025								
l •	OCATION	80%010		8020,201								
	MPLITUDE	1.997		1.988								
·	OCATION	 			· · · · · · · · · · · · · · · · · · ·		·					
CH. 4 A	MPLITUDE		•									
ł (OCATION											
FILE#												
EXAMINE		<u> </u>								l		
REMAR	r.o						•			•		
Examine) _e ,	E	xaminer			Revie	wer		Page		
Level III	Date_4	30 03	Ī	evelE	Date		Level	Date			of	

									•						
4/00	•		AU	ITO!	MATED UL			CAN					!		
1					CALIBRA					, '	ļ				
LOCAT	ION .	.,,	· 	SYS	TCAI	16-Eq #90Z									
1200E	AST :	TANK	FARM		- A⊬-10	NOT	30-146								
L OG	<u>EMA</u>	-SVI	JT- I	NS	- 007.	THICK		.O."		MATERIAL					
THE SYS	SEM 1			SER	HAL# 206	REFERENCE BLOCK									
SOFTW	ARE VER				REV.	THICK	NESS			MATERIAL					
LINEAR	NTY DUE	DATE,	تعليا	<u> </u>		REFER	ENC	E BLOCK TEMP		PYRO SN.					
- CCANIN	ER TYPE	<u>۵ ط ا</u>	<u>3</u>	660	1141 #			Amb	oF_	NA					
Au	S - E	id_		סבת	IIAL 共;			COUPL	JANI	H2°		BATCH# ∧	A		
SCANN	ER CABU	E Co	AX					CABLE	LEN	GTH IOFT	CABLE	AIA			
SIGNAL	CASLE	_	AX	٠.				CASLE	LEN	GTH SOFT	CASLE	ľλ	A		
CHANN		ANSDUC		MO	DEL	FREO.	SIZE	SERIAL		GATE EVAL METHOD	ANGLE NOMJACT.	WEDGE TYPE	IMAGE		
1		K	3.	n	OWB	4	Sygmm	30	3024		ᄔ	11112	3		
2									-	*			NE SE		
3												J	m Co		
4		· ·					<u> </u>	<u>.</u>					19		
	NITIAL	CALIBR			ļ			CALIBRATION CHECKS							
DATE			3/6/0	3	3/4/03					·					
	ECTOR	7	015		,050"					·					
	ENTAT		Notel		Notch	•									
CH. 1	AMPLI		807d												
	LOCAT	ION	1.414		1.467			~ <u>`</u>	_						
ČH, 2	AMPLI	TUDE			1										
	LOCAT	ION									i		-		
CH. 3	AMPLI		•												
<u> </u>	LOCAT														
CH. 4	AMPLI					1									
Eu E	LOCAT	ION	ļ												
FILE						·									
REMA			<u> </u>		<u> </u>										
LEMI	AUVO		-												
 -															
			· ·				•			······································					
												3			
Exam	iner) <u> </u>	.1	TE	xaminer	•		Rev	iew	er ,sy	7.	Page			
l evel	<u> </u>	ale 3/	(A) =	1	.evel	ate		I PI		Date	U.L.		of		
P-Sc		mut a		'					~· _						



May 20th. 2003

Mr. Daron Tate COGEMA Engineering Corp. 2425 Stevens Center Richland, WA. 99352

This letter is to certify that I have analyzed the P-scan automated ultrasonic data from Hanford waste tank AP 103. The data reviewed for the primary tank wall was collected by Mr. Nelson and Mr. Purdy January 27th. through April 30th, 2003. The data is acceptable. The data from vertical strips, vertical welds, horizontal weld and a OD gouge was analyzed to the requirements of COGEMA procedure SVUT-INS-007.3 Revision 1.

One indication in Vertical Weld 5 is being evaluated.

To date there are no reportable indications. No cracking, reportable pitting or other reportable thinning was detected in any of the areas examined.

Sincerely,

James B. Elder ASNT UT Level III

CC: Mr. W. H. Nelson - COGEMA

This page intentionally left blank.

ATTACHMENT 3

ULTRASONIC EXAMINATION OF DOUBLE-SHELL TANK 241-AP-103
EXAMINATION COMPLETED <u>APRIL 2003</u>
(PNNL THIRD PARTY REVIEW)

This page intentionally left blank.

Ultrasonic Examination of Double-Shell Tank 241-AP-103 Examination Completed <u>April 2003</u>

AF Pardini GJ Posakony

June 2003

Prepared for the U.S. Department of Energy under Contract DE-AC06-76RL01830

Pacific Northwest National Laboratory Richland, Washington 99352 This page intentionally left blank.

Summary

COGEMA Engineering Corporation (COGEMA), under a contract from CH2M Hill Hanford Group (CH2M Hill), has performed an ultrasonic nondestructive examination of selected portions of Double-Shell Tank 241-AP-103. The purpose of this examination was to provide information that could be used to evaluate the integrity of the wall of the primary tank. The requirements for the ultrasonic examination of Tank 241-AP-103 were to detect, characterize (identify, size, and locate), and record measurements made of any wall thinning, pitting, or cracks that might be present in the wall of the primary tank. Any measurements that exceed the requirements set forth in the Engineering Task Plan (ETP), RPP-11832 (Jensen 2002) and summarized on page 1 of this document, are reported to CH2M Hill and the Pacific Northwest National Laboratory (PNNL) for further evaluation. Under the contract with CH2M Hill, all data is to be recorded on disk and paper copies of all measurements are provided to PNNL for third-party evaluation. PNNL is responsible for preparing a report that describes the results of the COGEMA ultrasonic examinations.

Examination Results

The results of the examination of Tank 241-AP-103 have been evaluated by PNNL personnel. The ultrasonic examination consisted of two 15-in. wide scans over the entire height of the tank and the heat-affected zone (HAZ) of four vertical welds and one horizontal weld. The examination was performed to detect any wall thinning, pitting, or cracking in the primary tank wall.

Primary Tank Wall Vertical Scan Paths

Two 15-in.-wide vertical scan paths were performed on Plates #1, #2, #3, #4, and #5. The plates were examined for wall thinning, pitting, and cracks oriented vertically on the primary tank wall. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or vertical crack-like indications were detected in Plates #1, #2, #3, #4, or #5.

Primary Tank Wall Weld Scan Paths

The HAZ of vertical welds in Plates #2, #3, #4, and #5 were examined for wall thinning, pitting, and cracks oriented either perpendicular or parallel to the weld. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or crack-like indications were detected in the weld HAZ areas in Plates #2 and #3. In Plate #4, an outside diameter (O.D.) indication was noted and was reported as a gouge. This indication was not considered a crack-like indication and did not originate on the inside diameter of the primary tank. The gouge was reported as 1.42-in. in length and less than 0.100-in. in depth. In Plate #5, a linear indication 2.92-in. long was reported as an

indeterminate indication. This indication is being investigated and the results will be reported in a later document.

The HAZ of the horizontal weld between Plate #5 and the tank knuckle was examined for wall thinning, pitting and cracks oriented either perpendicular or parallel to the weld. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or crack-like indications were detected in the weld areas on Plate #5 side or on the knuckle side of the horizontal weld.

Contents

1.0	Introduction	1
2.0	Qualified Personnel, Equipment, and Procedure	2
	2.1 Personnel Qualifications	2
	2.2 Ultrasonic Examination Equipment	3
	2.3 Ultrasonic Examination Procedure	3
3.0	Ultrasonic Examination Configuration	4
	3.1 Primary Tank Wall Transducer Configuration	4
	3.2 Weld Zone Transducer Configuration	5
4.0	Ultrasonic Examination Location	7
5.0	Ultrasonic Examination Results	9
6.0	Conclusions	12
	6.1 Primary Tank Wall Vertical Scan Paths	12
	6.2 Primary Tank Wall Weld Scan Paths	
7.0	References	14

Figures

3.1	Transducer Configuration for Examining the Primary Tank Wall	4
3.2	Transducer Configurations for Examination of Weld Zone in the Primary Tank Wall	5
3.3	Views of the Weld Zone to be Ultrasonically Examined in the Primary Tank Wall	6
4.1	UT of 241-AP-103 from Riser 31	7
4.2	Sketch of Scan Paths on Tank 241-AP-103	8
5.1	UT Data from Tank 241-AP-103	10
5.2	UT Data from Tank 241-AP-103 cont	11

1.0 Introduction

COGEMA Engineering Corporation (COGEMA), under a contract from CH2M Hill Hanford Group (CH2M Hill), has performed an ultrasonic nondestructive examination (UT) of selected portions of Double-Shell Tank (DST) 241-AP-103. The purpose of this examination was to provide information that could be used to evaluate the integrity of the DST. The requirements for the UT of Tank 241-AP-103 were to detect, characterize (identify, size, and locate), and record measurements made of any wall thinning, pitting, or cracks that might be present in the wall of the primary tank. Any measurements that exceed the requirements set forth in the Engineering Task Plan (ETP), RPP-11832 (Jensen 2002), are reported to CH2M Hill and the Pacific Northwest National Laboratory (PNNL) for further evaluation. Specific measurements that are reported include the following:

- Wall thinning that exceeds 10% of the nominal thickness of the plate.
- Pits with depths that exceed 25% of the nominal plate thickness.
- Stress-corrosion cracks that exceed 0.10-in. (through-wall) that are detected in the inner wall of the tank, heat-affected zone (HAZ) of welds, or in the tank knuckle.

The accuracy requirements for ultrasonic measurements for the different types of defects are as follows:

- Wall thinning measure thickness within ± 0.020 -in.
- Pits size depths within ±0.050-in.
- Cracks size the depth of cracks on the inner wall surfaces within ± 0.1 -in.
- Location locate all reportable indications within ± 1.0 -in.

Under the contract with CH2M Hill, all data is to be recorded on disk and paper copies of all measurements are provided to PNNL for third-party evaluation. PNNL is responsible for preparing a report that describes the results of the COGEMA UT.

2.0 Qualified Personnel, Equipment, and Procedure

Qualification of personnel participating in the DST inspection program, the UT equipment (instrument and mechanical scanning fixture), and the UT procedure that will be used in the examination of the current DST is required by CH2M Hill. Personnel participating in the examinations are to be certified in accordance with the American Society for Nondestructive Testing (ASNT) Guideline SNT-TC-1A-92 and associated documentation is to be provided. The capability of the UT system is to be validated through a performance demonstration test (PDT) administered by PNNL on a mock-up simulating the actual DST. The current procedure for the UT is to be based on the Section V, Article 4, Boiler and Pressure Vessel Code defined by the American Society for Mechanical Engineers (ASME).

2.1 Personnel Qualifications

The following individuals were qualified and certified to perform UT of the Hanford DST 241-AP-103:

- Mr. Wesley Nelson, ASNT Level III (#LM-1874) in UT, has been identified as COGEMA's UT
 Level III authority for this project. Mr. Nelson has been certified by COGEMA as a UT Level III in
 accordance with COGEMA procedure COGEMA-SVCP-PRC-014, latest revision. Further
 documentation has been provided to establish his qualifications. Reference: Letter from PNNL to
 C.E. Jensen dated August 22, 2000, "Report on Performance Demonstration Test PDT, May 2000."
- Mr. James B. Elder, ASNT Level III (#JM-1891) in UT, has been contracted by COGEMA to provide peer review of all DST UT data. Mr. Elder has been certified by JBNDT as a UT Level III in accordance with JBNDT written practice JBNDT-WP-1, latest revision. Further documentation has been provided to establish his qualifications. Reference: PNNL-11971, Final Report Ultrasonic Examination of Double-Shell Tank 241-AN-107.
- Mr. William D. Purdy, COGEMA UT Level II limited (for P-Scan data acquisition only).
 Mr. Purdy has been certified in accordance with COGEMA procedure COGEMA-SVCP-PRC-014, latest revision. Further documentation has been provided to establish his qualifications. Reference: Letter from PNNL to C.E. Jensen dated October 5, 2001, "Purdy Performance Demonstration Test (PDT) Report."

2.2 Ultrasonic Examination Equipment

CH2M Hill has provided the UT equipment for the examination of Tank 241-AP-103. This equipment consists of a Force Institute P-Scan ultrasonic test instrument and a Force Institute AWS-5D remote-controlled, magnetic-wheel crawler for examining the primary tank wall. Ultrasonic transducers used for the examinations are commercial off the shelf. The P-Scan ultrasonic system has been qualified through a PDT administered by PNNL. Reference: PNNL-11971, Final Report- Ultrasonic Examination of Double-Shell Tank 241-AN-107.

2.3 Ultrasonic Examination Procedure

COGEMA-SVUT-INS-007.3, Revision 1, outlines the type of UT and mechanical equipment that are to be used as well as the types of transducers. Both straight-beam and angle-beam transducers are used for the examination of the primary tank wall and the HAZ of selected primary tank vertical and horizontal welds. The examination procedures include full documentation on methods for calibration, examination, and reporting. Hard copies of the T-Scan (thickness) and P-Scan (projection or angle beam) views of all areas scanned are made available for analysis. The UT procedure requires the use of specific UT transducers for the different examinations. A calibration performed before and after the examinations insures that each transducer used in the inspection is adjusted and that the entire system is performing correctly. The COGEMA UT procedure has been qualified through a PDT. Reference: PNNL-11971, Final Report - Ultrasonic Examination of Double-Shell Tank 241-AN-107.

3.0 Ultrasonic Examination Configuration

COGEMA is required to inspect selected portions of the DSTs which may include the primary and secondary tank walls, the HAZ of the primary tank vertical and horizontal welds, and the tank knuckle and bottoms. The P-Scan system has been configured to perform these examinations and has been performance tested. The examination of Tank 241-AP-103 included UT of the primary tank wall and the HAZ of selected welds in the primary tank wall.

3.1 Primary Tank Wall Transducer Configuration

Figure 3.1 provides an example of the scanning configuration generally used during an examination of the primary tank wall. However, other configurations can be used at the discretion of the COGEMA UT Level III (i.e., 45-degree transducers can be removed for simple wall thickness measurements). The functional diagram in Figure 3.1 shows one straight-beam and two angle-beam transducers ganged together for examining the primary tank wall. The straight beam is designed to detect and record wall thinning and pits, and the angle beams are designed to detect and record any cracking that may be present. These transducers are attached to the scanning bridge and they all move together. Information is captured every 0.035-in. (or as set by the NDE inspector) as the assembly is scanned across a line. At the end of each scan the fixture is indexed 0.035-in. (or as set by the NDE inspector) and the scan is repeated. The mechanical scanning fixture is designed to scan a maximum of 15-in. and then index for the next scan. The hard copy provides a permanent record that is used for the subsequent analysis.

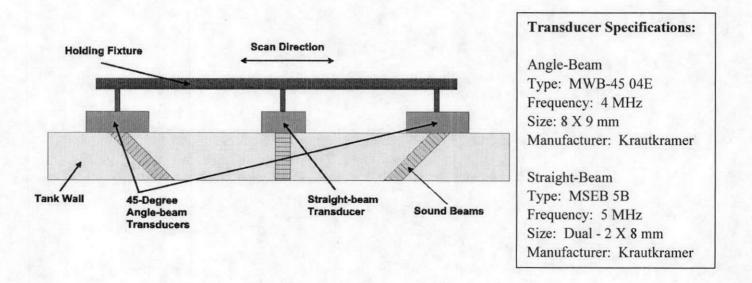


Figure 3.1. Transducer Configuration for Examining the Primary Tank Wall

3.2 Weld Zone Transducer Configuration

Figure 3.2 is a functional sketch that shows the configurations for examination of the weld zone. The area of interest (HAZ of the weld) is shown as lying adjacent to the weld. Both cracks and pitting may occur in this region. The "A" portion of this sketch shows the 60-degree angle-beam transducers used for detecting cracks parallel to the weld. The straight-beam transducers in this sketch are used for detecting and recording any pitting or wall thinning that may be present. All transducers are ganged together. The scanning distance traveled is limited to a total of approximately 5.0-in. The sketch titled "B" shows the arrangement for detecting cracks that may lie perpendicular to the weld. Four 45-degree, angle-beam transducers are used for this inspection. Again the transducers are ganged together but the scan is limited to a total of approximately 4.0-in. The weld zone requirements are shown in Figure 3.3. The scan protocol, data capture, and index are the same for examining other weld areas in the tank.

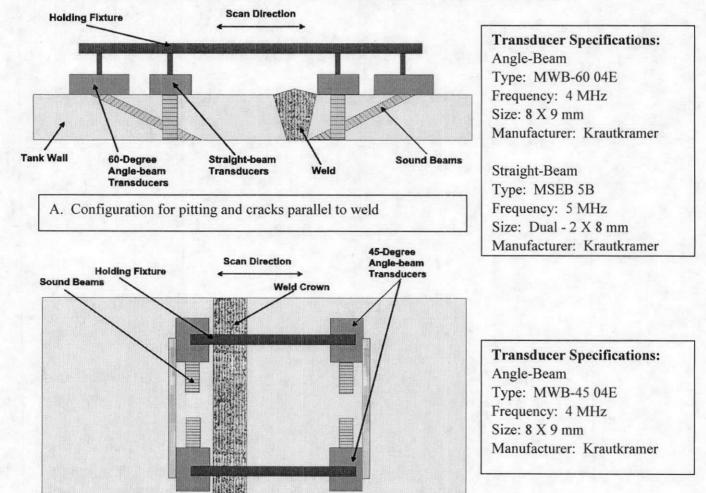
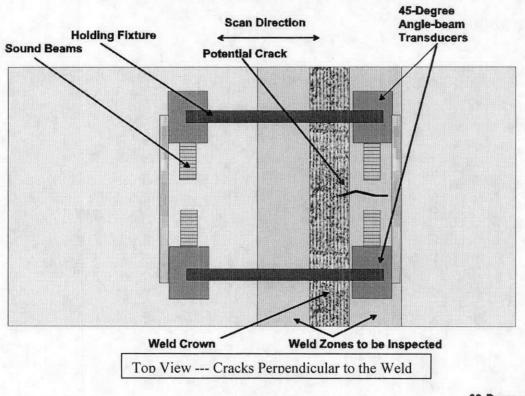
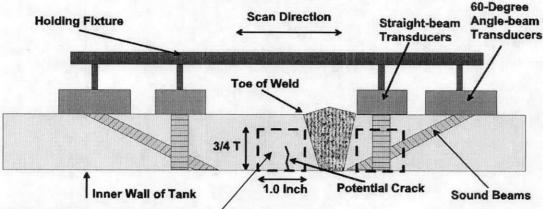


Figure 3.2. Transducer Configurations for Examination of Weld Zone in the Primary Tank Wall

B. Configuration for cracks perpendicular to weld

In the HAZ, the requirement for characterizing cracks that lie perpendicular or parallel to welds in the primary tank wall is described in Figure 3.3. The HAZs are located on either side of the weld and defined as being within 1-in. of the toe of the weld and on the inner three-quarters of the thickness (3/4T) of the plate. These zones are considered most likely to experience stress-corrosion cracking.





A zone ¾ T from the inner surface and 1.0-in. from the toe of the weld is to be ultrasonically examined for cracking, corrosion or pitting. Examinations are to be made on both sides of the weld.

End View --- Cracks Parallel to the Weld

Figure 3.3. Views of the Weld Zone to be Ultrasonically Examined in the Primary Tank Wall

4.0 Ultrasonic Examination Location

Tank 241-AP-103 is located in the Hanford 200 East area in AP Tank Farm. The crawler and associated scanner that hold the transducers were lowered into the 24-in. riser located on the west side of 241-AP-103 and designated as Riser 31. Riser 31 was originally called out as Riser 6 West. Figure 4.1 provides a graphic of the location of this riser.

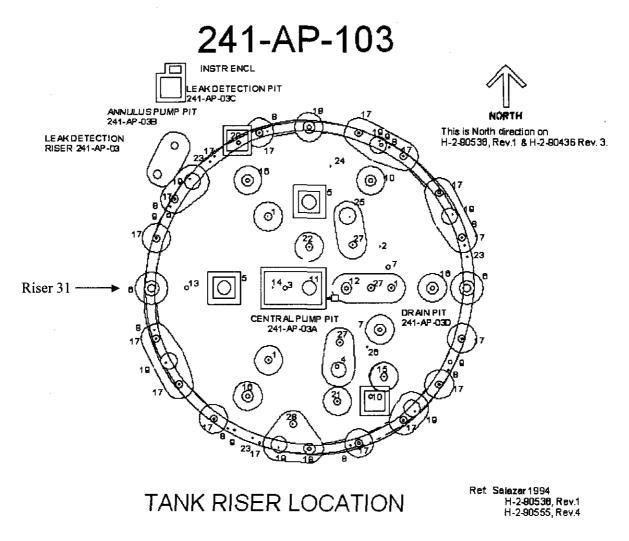


Figure 4.1. UT of 241-AP-103 from Riser 31

Figure 4.2 describes the areas on the primary wall of Tank 241-AP-103 that were ultrasonically examined. Two 15-in.-wide vertical scan paths were performed on Plates #1, #2, #3, #4, and #5 below the entrance to Riser 31. Vertical weld HAZ examinations were done on Plates #2, #3, #4, and #5, and the horizontal weld HAZ examination was done on the transition Plate #5 to knuckle weld.

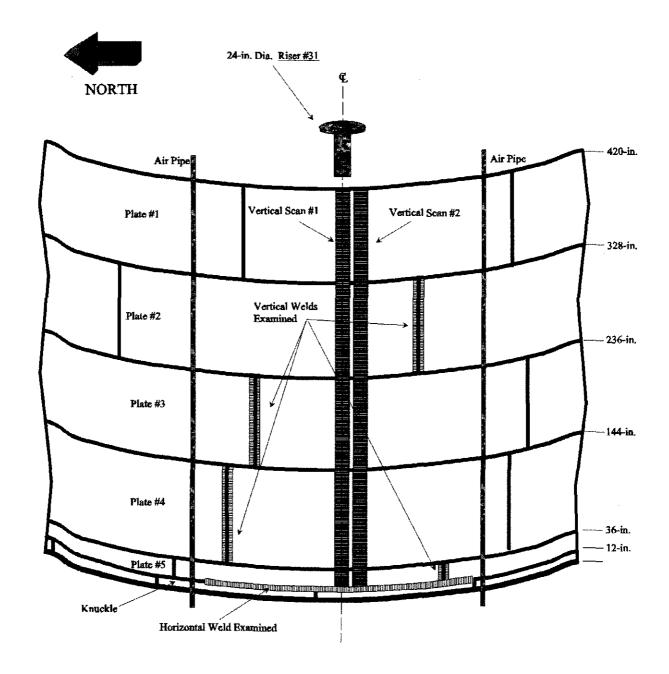


Figure 4.2. Sketch of Scan Paths on Tank 241-AP-103

5.0 Ultrasonic Examination Results

COGEMA has provided detailed reports including T-Scan and P-Scan hard copies of all areas that were ultrasonically examined to PNNL for third-party review. The data was analyzed by COGEMA Level III Mr. Wes Nelson and peer reviewed by JBNDT Level III Mr. Jim Elder. The results of the examination of Tank 241-AP-103 are presented in Figures 5.1 and 5.2.

Figures 5.1 and 5.2 show the wall thickness examination results for the primary tank wall and the HAZs of both vertical and horizontal welds. The examination consisted of two vertical paths beneath the 24-in. diameter riser. Vertical scan #1 was 15-in. wide on Plates #1, #2, #3, #4, and #5 and started directly below the centerline of the 24-in. riser. Vertical scan #2 was adjacent to vertical scan #1 and was also 15-in. wide on Plates #1, #2, #3, #4, and #5. The HAZs of vertical welds in Plates #2, #3, #4, and #5 were examined and the HAZ in the horizontal weld between Plate #5 and the knuckle section was also examined. Areas in the figures that show two measurements in the same box are the result of the vertical scan paths overlapping the horizontal HAZ scan paths. Figures 5.1 and 5.2 display the minimum readings taken in each 15-in. wide by 12-in. long area of the scan. In the overlapping areas, both minimum readings from each of vertical and horizontal scan paths are given. The highlighted area in Plate #4 shows where the O.D. gouge was reported. The highlighted area in Plate #5 shows where the linear indication that is being further investigated was reported.

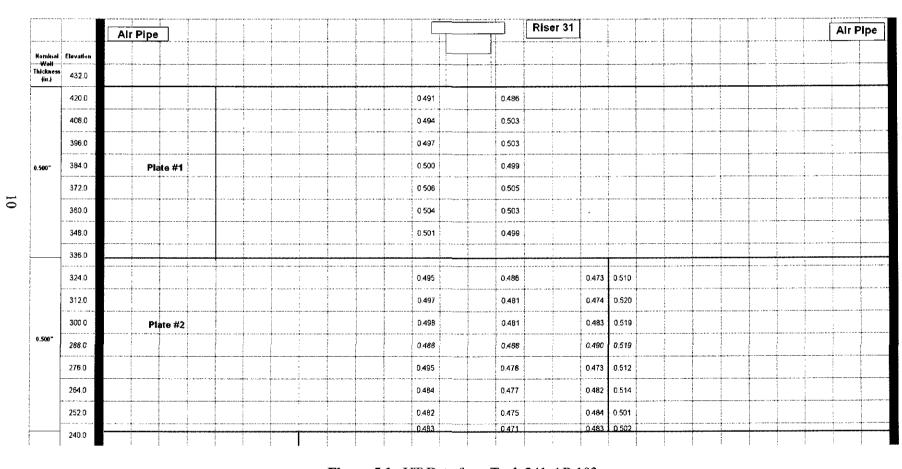


Figure 5.1. UT Data from Tank 241-AP-103

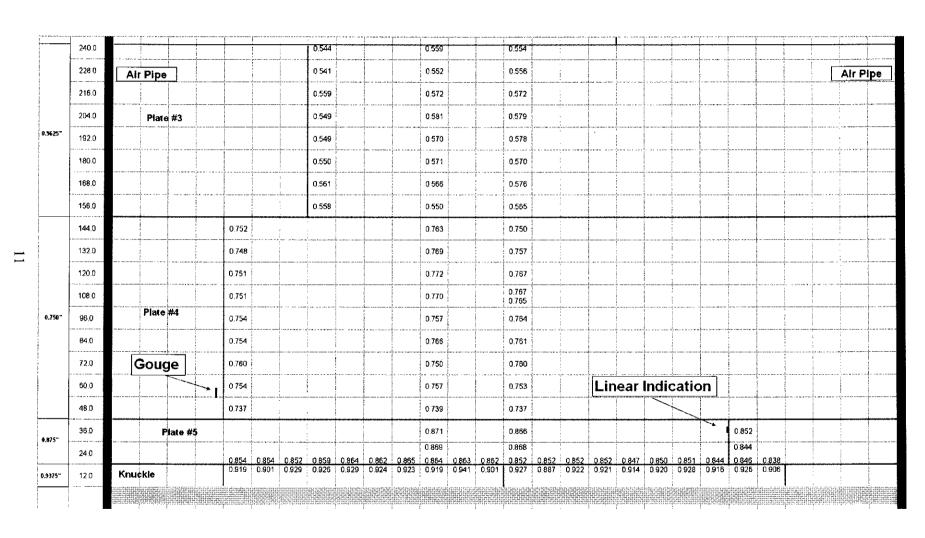


Figure 5.2 UT Data from Tank 241-AP-103 cont.

6.0 Conclusions

The results of the examination of Tank 241-AP-103 have been evaluated by PNNL personnel. The examination consisted of two 15-in. wide scans over the entire height of the tank and the HAZs of 4 vertical welds and 1 horizontal weld. The examination was performed to detect any wall thinning, pitting, or cracking in the primary tank wall.

6.1 Primary Tank Wall Vertical Scan Paths

Two 15-in.-wide scan paths were performed on Plates #1, #2, #3, #4, and #5. The plates were examined for wall thinning, pitting, and cracks oriented vertically on the primary tank wall. The results indicated that the minimum thicknesses in the areas scanned with nominal thickness of 0.500-in. were as follows; Plate #1 was 0.486-in. and Plate #2 was 0.471-in. The nominal thickness in Plate #3 is 0.5625-in. and the minimum thickness in this area was 0.550-in. The nominal thickness in Plate #4 is 0.750-in. and the minimum thickness in this area was 0.737-in. The nominal thickness in Plate #5 is 0.875-in. and the minimum thickness in this area was 0.866-in. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or vertical crack-like indications were detected in Plates #1, #2, #3, #4, or #5.

6.2 Primary Tank Wall Weld Scan Paths

The HAZ of vertical welds in Plates #2, #3, #4, and #5 were examined for wall thinning, pitting and cracks oriented either perpendicular or parallel to the weld. The results indicated that the minimum thicknesses in the weld areas scanned were as follows: The nominal thickness of Plate #2 is 0.500-in. and the minimum thickness in this weld area was 0.473-in. The nominal thickness in Plate #3 is 0.5625-in. and the minimum thickness in this weld area was 0.541-in. The nominal thickness in Plate #4 is 0.750-in. and the minimum thickness in this weld area was 0.737-in. The nominal thickness in Plate #5 is 0.875-in. and the minimum thickness in this weld area was 0.844-in. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or crack-like indications were detected in the weld areas in Plates #2 and #3. In Plate #4, an outside diameter (O.D.) indication was noted and was reported as a gouge. This indication was not considered a crack-like indication and did not originate on the inside diameter of the primary tank. The indication is located on the north side of the vertical weld in Plate #4 near the bottom of the plate. The gouge was reported as 1.42-in. in length and less than 0.100-in. in depth. In Plate #5, a linear indication 2.92-in. long was reported as an indeterminate indication. This indication is located approximately 6-in. below the horizontal weld between Plate #4 and Plate #5 and adjacent to (north) the vertical weld. This indication is being investigated and the results will be reported in a later document.

The HAZ of the horizontal weld between Plate #5 and the tank knuckle was examined for wall thinning, pitting and cracks oriented either perpendicular or parallel to the weld. The results indicated that the minimum thickness in the weld area with nominal thickness of 0.875-in. on Plate #5 was 0.838-in. The minimum thickness in the weld area with nominal thickness of 0.9375-in. on the knuckle was 0.887-in. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or crack-like indications were detected in the weld areas on Plate #5 side or on the knuckle side of the horizontal weld.

7.0 References

Jensen, C. E., 2002, Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks FY2003, RPP-11832, Rev 0, September 2002, CH2M Hill Hanford Group, Inc., Richland, Washington.

Distribution

No. of Copies

Offsite

- 4 DOE/Office of Scientific and Technical Information & Information Release
- DOE Office of Science and Technology
 Kurt Gerdes
 1154 Cloverleaf Building
 19901 Germantown Road
 Germantown, MD 20874-1290

Onsite

4 Hanford Site

J. L. Castleberry (1)	R3-76
G. P. Duncan (1)	R3-76
C. E. Jensen (2)	R3-76

10 Pacific Northwest National Laboratory

M. T. Anderson (1)	K5-26
J. W. Brothers (1)	K7-15
L. O. Casazza (1)	K5-26
A. F. Pardini (6)	K5-26
G. J. Posakony (1)	K5-26

This page intentionally left blank.